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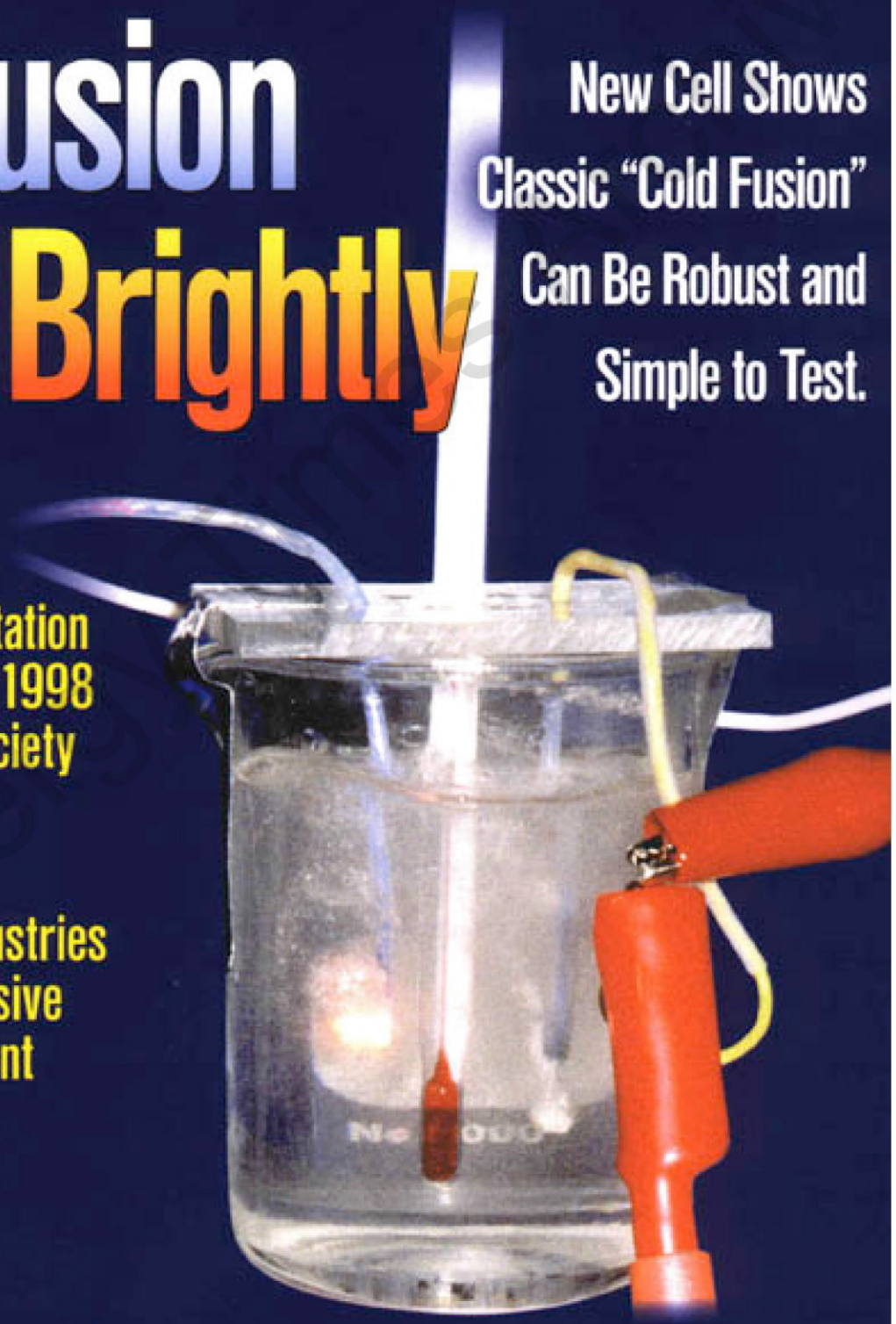

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by Tadahiko Mizuno
Nuclear Engineering, Hokkaido University

ENGLISH TRANSLATION
by Jed Rothwell

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SEE *IE* ISSUE #17 FOR JED ROTHWELL'S REVIEW AND THIS ISSUE FOR PROF. GEORGE MILEY'S COMMENTS ON PAGE 35

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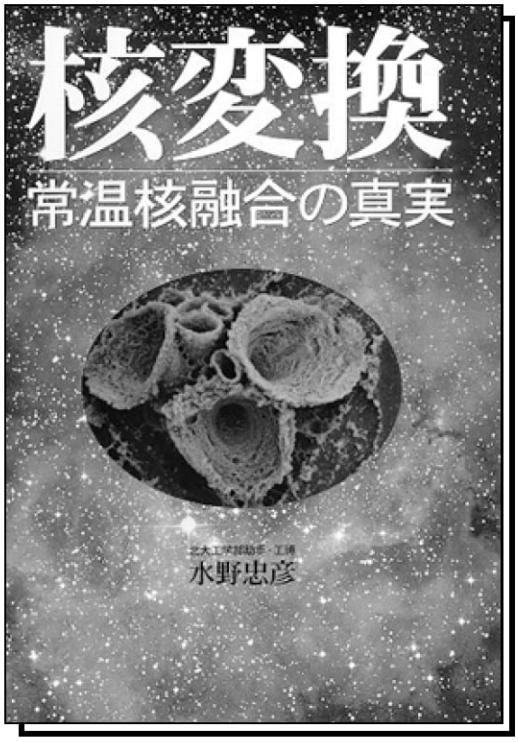

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Volume 4, No. 20, June-July, 1998

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About the cover:
A 250 ml Pyrex beaker with an alcohol thermometer suspended from a perforated plastic cover is used to demonstrate the spectacular underwater incandescence of the "Ohmori-Mizuno Effect" at the laboratory of Cold Fusion Technology, Inc. in Bow, New Hampshire. With a tungsten cathode (left side, glowing), a platinum anode (right side, evolving oxygen bubbles), and an electrolyte solution of potassium carbonate (K_2CO_3 - in the range 0.5 molar), anyone with a suitable DC power supply can demonstrate this effect. (Alligator clips are for power input through insulated platinum wire leads and attachement to the voltage and current measuring system.) By some reports, this kind of cell produces excess power and heavy element transmutations on the cathode surface. WARNING: Adequate safety precautions must be employed in this frontier science experiment! A full report on pages 9-17.*(Cover Art: Jeremy Slayton; Photo: EFM)*

New Energy Times Archive

By Eugene F. Mallove, Sc.D.

Hands-On Cold Fusion

For the past two months we have been juggling experiments and doing lots of hands-on work. Juggling validation projects is not the best way to do them, we admit, but so many new devices and claims have come to the fore that this time-sharing of experimentation and timely reporting has become necessity. So please forgive us if we seem to have put your favorite new-energy anomaly temporarily on the back burner while we check out several new things. We promise that we'll eventually get back to everything we started. Remember, if we in this field had but a minute fraction of the resources of the U.S. DOE, Mobil, or Exxon, we could put a team in charge of each investigation. But cold fusion and new energy do not (yet!) have those resources.

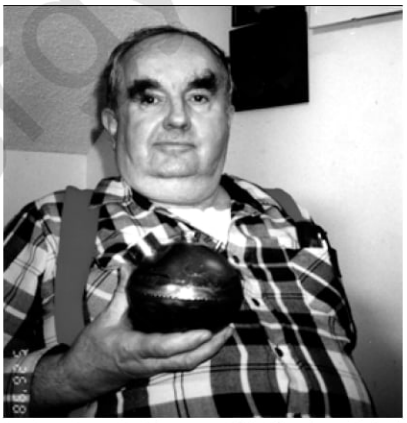
Also, realize that testing units and publishing are not all that we do. While switching among these experiments we were preparing to publish Dr. Mizuno's blockbuster cold fusion book (please order your copy very soon), and we were in the midst of producing a one-hour cold fusion video documentary, which should be available by the end of the year.

We were also obligated to proceed with investigations of other remarkable claims about new energy devices. We hope these on-going studies will lead to reports in subsequent issues. One such device that has come to our attention is so bizarre—yet seemingly verified by the weight of the evidence—that we hesitate to mention it. *We won't!* It has a very long history, the usual "crazy" inventor, intrigue, patents, efforts at commercial development, and even a high-profile Nobel laureate who blew a chance to get to the bottom of it. It *may* be related to new nuclear physics. It will probably take an entire issue of *Infinite Energy* to explain this one—assuming we can explain it at all. Whether the device evidences new physics or not, the true story surrounding it makes the fiction of this summer's movie "blockbusters" tame by comparison.

Asteroids striking Earth and threatening civilization? A realistic threat, to be sure! But what about *proved* developments that have the potential to wipe out the entire existing energy infrastructure of the world—and *will do so*, as far as we are concerned?

We are trying to multiply our energies by encouraging those who have frontier devices that we have already discussed to make self-sustaining systems. A prime example is the "catalytic fusion" work of Dr. Leslie Case here in New Hampshire, which we reported in issue #19. Les still has not succeeded in making a self-heating, self-sustaining unit in an insulating dewar cell. But he is hard at work, even through the discouragement of finding catalyst bed geometries, once thought to be promising, that fail to work. So convinced is Dr. Case that he is iterating on the right track, that he intends to make a 150-watt scaled-up self-sustainer as soon as possible after he makes the basic small unit succeed. By the end of this summer we may know whether he has succeeded, or whether there is a hidden fundamental error in his temperature measurements. (He has succeeded several times in getting higher catalyst temperatures above ordinary hydrogen baseline than were demonstrated to us here and reported in *IE* #19—in one experiment he reached 36 °C above hydrogen baseline with deuterium gas.)

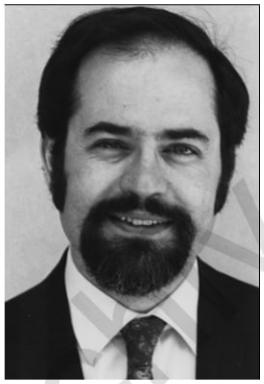
An independent group is now working with Dr. Case to detect helium-4 buildup while its catalytic fusion experiment is running. They are using an inline



Dr. Les Case holds a modified (reduced size) catalytic fusion cell in a visit to our offices.

mass spectrometer, checking the helium-4 buildup as a function of time. They are mindful that helium-4 buildup could represent atmospheric leakage into the reactor, unless the buildup exceeds five parts per million (ppm). We hope to have more information on these measurements by the end of the summer.

Possibly the most important development, and the subject of this issue's feature cover story, is the growing number



of people who have reproduced the "Ohmori-Mizuno Effect." Coming from two outstanding researchers in Japan, it is a relatively simple, "do-it-yourself" approach that will allow almost any lab to plunge into cold fusion experiments with ordinary water electrolysis. No palladium and no heavy water needed, just a tungsten cathode (easily obtained from a welding supply shop), potassium carbonate solution, and a high-voltage DC power supply. The most welcome aspect of this experiment is that it is instantly clear whether the effect has occurred—you can hardly fail to miss it unless you are both blind and deaf!

All the details for the experiment we could think of are spelled-out in a cookbook, hands-on recipe that evolved from our own efforts to witness the effect. The visual and auditory impact of the effect is spectacular—a brilliant, colorful, plasma-like underwater discharge. Even our color cover photo doesn't do the *real thing* justice. The scientific phenomenon is surprising and interesting in its own right, apart from the mind-wrenching realization that the transmutation of heavy elements seems to have been observed by Ohmori and Mizuno in this "electro-alchemy" experiment. This issue contains their entire report to ICCF-7, the recent 7th International Conference on Cold Fusion.

We cannot be absolutely sure *yet* that the Ohmori-Mizuno effect is an excess energy producer, though some results so far are trending in favor of over-unity. Dr. Dennis Cravens of CETI told me that at the last meeting of the American Nuclear Society in Albuquerque, New Mexico he demonstrated a tungsten cathode-based alternating current electrochemical cell that does, in his opinion, produce 20 to 30% excess energy. On the other hand, Dr. Jean-Paul Biberian in France tried the general DC-power Ohmori-Mizuno recipe we recommended and found no excess energy in his boiling cell. We learned about these developments just as we went to press.

To nail down the Mizuno-Ohmori

Editorial continued on page 5

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Editorial continued from page 3

effect as nuclear-related excess energy requires determining that the *magnitude* of a sustained excess power gives a total energy release much greater than could be provided by any conceivable chemical reaction. This is no small feat, since the intensity of the effect boils away the water and often makes the cathode disintegrate before that. But those with access to analytical chemistry labs may be able to prove the transmutation claims, independent of calorimetric measurements.

Given the growing prominence of evidence for low-energy nuclear reactions (a one and a half day special session was held at the Annual American Nuclear Society Meeting—see our report, page 18), it seems highly likely that the Ohmori-Mizuno results will hold up as genuine anomalies.

Thanks to the good work of FAA engineer Ed Wall, who sacrificed some of his vacation time to visit here and work at our laboratory, we were able to get in some additional testing of the Perkins-Pope Kinetic Furnace—still in our view one of the best avenues for rapid commercialization of water-fueled technology. Encouraged by continued high over-unity results from Perkins and Pope in Georgia, we plunged ahead. Since Unit #1 shipped here initially had failed to evidence significant excess power, despite our efforts to tinker with it, we took delivery on a replacement unit shipped to us from Kinetic Heating Systems, Inc.

We were amazed to find that whatever subtle changes may have occurred in transport—out-gassing of the water due to vibration or other still unknown environmental changes—resulted in only a nominal 8% to 15% excess energy. Very disappointing, to say the least. Intriguing result, but not enough, in our view, to call these Unit #2 tests convincing evidence of over-unity *in Bow*.

This is far cry from the 200% and beyond that had been readily apparent at Kinetic Heating Systems. In our view, there is not a significant chance that this is gross mis-measurement either here in Bow or in Georgia. There is a clear difference in performance— here versus there, and we must determine *why*. The good news is that when we and Perkins-Pope find the root cause of the reduction or failure of the effect, we will know how to proceed to stabilize and sustain it. We have done testing of the Kinetic Furnace air flow duct calorimeter reported in last issue, using pure resistive loads (arrays of light bulbs). We found that our measurement resolution for an input power addition from the bulbs is at least as good as 200 watts, so this 15% excess (about 500 watts) may well be real over-unity performance, but we can't be sure. So, our first priority will be to try various gas, chemical, and perhaps magnetic treatments of the water in the Kinetic Furnace to see what the source of the problem might be.

This issue contains more cold fusion and transmutation reports from ICCF-7, such as the extraordinary work done by Mitsubishi Heavy Industries in Japan and in France by Dr. Jacques DuFour. Hal Fox of Trenergy, Inc. reports his company's work on radioactive waste transmutation. It is most unfortunate that the general media have by and large ignored this revolution in-the-making. They'll eventually wake up, of that we have no doubt. For now, we'll go on publishing and experimenting, with no preconceptions about what new tricks mother nature might have up her sleeves. We hope you will all join us in this great adventure. If you can, why not do some hands-on cold fusion experiments of your own? ∞

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Sir Arthur C. Clarke Challenges the Scientific Community with Provocative Essay in Science

by Eugene Mallove

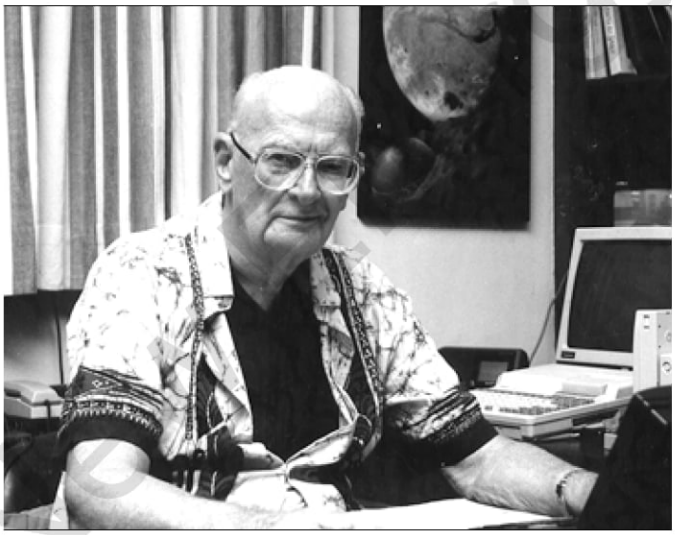
Science, Vol. 280
June 5, 1998

"Cold Fusion scientists need not apply." Yes, the pages of *Science* Magazine are closed to them. *Science* , the magazine of the American Association for the Advancement of Science, has a standing policy (unwritten but demonstrated *in practice* many times) of rejecting any submitted scientific articles on cold fusion that provide supportive evidence. In June 1990, *Science* published a virtually libelous article by journalist Gary Taubes against the research group at Texas A&M University—alleging the likelihood that tritium was fraudulently introduced into electrochemical cold fusion cells by associates of Distinguished Professor of Chemistry John O'M. Bockris. These accusations were baseless and were disproved, but they were published and never withdrawn by *Science* —or by Taubes.

This negativity did not stop Sir Arthur C. Clarke, who since 1992 has been a serious student of the cold fusion controversy. He penetrated the *Science* barrier. Clarke is so revered by most scientists, that *Science* dared not prevent him from stating his opinion of cold fusion when it invited him to participate in its "Science and Society" series of essays.

...perhaps one of the greatest scandals in the history of science, the cold fusion caper.

The lead essay in the June 5, 1998 issue of *Science* is Clarke's eloquent, "Presidents, Experts, and Asteroids." In this wide-ranging composition, Clarke makes his position very clear. He politely calls the treatment of cold fusion "perhaps one of the greatest scandals in the history of science." By implication, he criticizes the well-known negative position of *Science* magazine on this topic. It will be interesting to see whether even the mighty Sir Arthur can cause a re-assessment of cold fusion at *Science*.



SIR ARTHUR CLARKE, a graduate of King's College, London, is the author of numerous works of science and science-fiction, including his well-known collaboration with Stanley Kubrick on the movie *2001: A Space Odyssey*. He is presently Chancellor of the International Space University and Chancellor of the University of Moratuwa, Sri Lanka, where he has lived for 30 years. He is the acknowledged originator of the concept of geosynchronous communication satellites that have made our world One—almost.

Clarke opens his essay with: "For more than a century science and its occasionally ugly sister technology have been the chief driving forces shaping our world. They decide the kinds of futures that are possible. Human wisdom must decide which are desirable. It is truly appalling, therefore, that so few of our politicians have any scientific or engineering background." (Amen!)

After musing on various themes—from the failings of experts ("Lord Kelvin's declaration that x-rays must be a hoax, and Ernest Rutherford's even more famous dismissal of atomic energy as 'moonshine.'") to what can be done about the threat of asteroid impacts, Clarke ascends to the *unthinkable*—support for cold fusion:

"Even more controversial than the threat of asteroid impacts is what I would call perhaps one of the greatest scandals in the history of science, the cold fusion caper. Like almost everyone else, I was surprised when Pons and Fleischmann announced that they had achieved fusion in the laboratory; and surprise changed to disappointment when I learned that most of those who had rushed to confirm these results were unable to replicate them. Wondering first how two world-class scientists could have fooled themselves, I then forgot the whole matter for a year or so, until more and more reports surfaced, from many countries, of anomalous energy production in various devices (some of them apparently having nothing to do with fusion). Agreeing with Carl Sagan's principle that 'extraordinary claims require extraordinary proofs' (spoken in connection with UFOs and alien visitors), I remained interested, but skeptical."

"Now I have little doubt that anomalous energy is being produced by several devices, some of which are on the market with a money back guarantee, while others are covered by patents. The literature on the subject is now enormous, and my confidence that 'new energy' is real slowly climbed to the 90th percentile and has now reached the 99% level. A Fellow of the Royal Society, also originally a skeptic, writes: 'There is now strong evidence for nuclear reactions in condensed matter at low temperature.' The problem, he adds, is that 'there is no theoretical basis for these claims, or rather there are too many conflicting theories.'"

"Yet recall that the steam engine had been around for quite a while before Carnot explained exactly how it worked. The challenge now is to see which of the various competing devices is most reliable. My guess is that large scale industrial application will begin around the turn of the century—at which point one can imagine the end of the fossil-fuel-nuclear age, making concerns about global warming irrelevant, as oil-and-coal-burning systems are phased out..."

"Finally, another of my dubious predictions: Pons and Fleischmann will be the only scientists ever to win both the Nobel and the Ig Noble Prizes."

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LETTERS TO THE EDITOR

Please begin my renewal with the Issue No. 19.

I guess you could call me a true believer. I laud the work you're doing and especially admire the perseverance of Eugene Mallove in the face of what must seem like total rejection. Be assured though, this is only one of several areas to my knowledge in which the dogmatic views and selfpreservation instincts of orthodox scientists are thwarting important advances in knowledge or technology.

I eagerly anticipate each issue of Infinite Energy.

Robert C. Slate
Seattle, WA

Marinov Motor Update

•—•—•

Well, no sooner does my latest article come out ("How to Think About the Marinov Motor, *Infinite Energy* #19, p. 57-61) and some experimentalist comes along and falsifies my hypothesis—fortunately, I'm that experimentalist. Now that you've had a chance to see the video I made of my latest impossible results with the Marinov Motor, I think you can appreciate my current state of utter bafflement.

For those who have yet to see the video (perhaps we should make it, or a more professionally produced version, available), let me describe some of what's on it.

1) Since there had been some talk about my writing up my experimental results for the mainstream, I decided I'd like to go back and redo most of my work in a more organized manner. Since mainstream readers would be sure to bring up the question of whether or not the leads were responsible for the observations witnessed of the Marinov Motor in action, I made some test probes and with a suspended toroid and fixed ring, proceeded to bring the leads in from all possible angles—up and down; sideways; tangential; one up, one tangential—you get the idea. I witnessed no noticeable differences in torus response to current. It always turned counterclockwise when the positive lead was on the left and N was up on the left.

At this point I need to describe the torus. I made something a little different, something more regular. I took two stacks of 20 thin-wafer-sized and shaped Nd magnets. This makes a stack 1 and 13/16 inches in height, and nearly square in cross-section when the two stacks are put together. It is a very regular shape, easy to work with, and the geometry simplifies analysis. Also, for the video, I used two 9-volt batteries connected in parallel.

2) Dr. Phipps had supplied me last week with some tungsten wire to use as leads for dipping into mercury. On the video you can see me using small beads of mercury as brushes to supply power to the ring. These beads just sit on the Plexiglass table above which my ring is hung—there is nothing holding them in place save their own weak adherence to the Plexiglass. They are easy to push around.

With beads of Hg on the outside of the ring, as can be seen in the video, this works well. The ring starts to accelerate easily and smoothly in the clockwise direction; you get a near perfect little demonstration of what the Marinov Motor is supposed to do in the rotating ring case. (This from a copper ring glued to a 6-oz. Styrofoam coffee cup.)

So far, everything in my article from *IE* 19 is borne out.

3) However, when the Hg brushes are positioned to the inside of the ring, the ring rotates counterclockwise. Since this brush position reverses the hypothesized "Lorentzian hook," well, who more chagrined than I to find the ring promptly do begin to rotate in the *reverse direction!* And with about the same acceleration, too. (My only feeling for how I managed to fool myself earlier when I touched *wire* brushes to the inside of the ring and got the same rotational sense as to the outside is that touching brushes to the inside is a trickier business, and I had little experience with it. I'd spent hours with brushes to the outside of the ring, so I knew how not to fool myself in those cases, (as my Hg brushwork vindicated). But I spent only enough time touching the brushes to the inside to see what I expected to see anyway. Oops!)

4) This reversal result briefly looks good for the Lorentzians, until it is recalled that *torus* rotation sense does not change *no matter where one puts the brushes on the ring.*

Also in the video you see me replace the ring with a thin circle of #21 wire of the same average diameter (the ring I used was > 2.5" i.d., and > 3" o.d.). Again, the torus turns as before, both in sense and magnitude.

You also see me substitute flimsy pieces of aluminum foil for the probes, and witness that the reaction forces turning the magnet can not be operating between the brushes and the torus.

Well then, just what are the reaction forces operating between?

5) The implications are staggering. If the torus continues to rotate the same way no matter where the leads touch, but the ring reverses direction with the leads to the inside, the only thing to do is to see what happens if *both* the torus and the ring are allowed to turn.

Of course, this is exactly what I do in the last demonstration. Since the moment of inertia of the torus is much lower than of the ring assembly, I found it necessary to half-submerge the torus in a well filled with cold pancake syrup to slow down its response. What one sees in the video is that *both the ring and the torus, from a standing start, begin to rotate counterclockwise.*

6) So, from a standing start, ring and torus turn counterclockwise, the ring continuously, the torus a slow quarter-turn to the null position (at which time the ring is then just coasting). Ummm... What gives? If there are reaction forces between the beads of Hg, which are free to move, and the torus, which is rotating against the drag of the cold syrup, why don't the beads of mercury just zip away? How can the ring be rotating by reacting

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against the torus, and vice versa, if they both go initially in the same direction? And how can the ring be reacting against the brushes if the Hg beads, which are free to move, don't?

7) Since making the video, I have also tried to rotate a shell assembly. Despite having a slightly *higher* moment of inertia than the ring assembly, but a delta r-value more than 100 (maybe 500) times less, the shell *still* accelerated at a rate on the same order as the ring assembly. (My guess is that it accelerated about three-quarters as fast as the ring assembly, which can probably be accounted for by the larger value for the moment of inertia. I couldn't do more than one rotation because aluminum foil + Hg + electricity results in a flaky residue that fouled the mercury.)

8) For those thinking that some kind of global circuit interaction/geometry must be responsible, in the video I bring my power in, from the two 9 volt batteries, from about 45 feet away through a twisted pair of wires. The outside circuit geometry never seems to make a bit of difference in how the Marinov Motor operates.

9) Finally, also not shown in the video, an attempt with one brush inside and one outside to a regular ring resulted in almost no rotation.

I am fully aware that the results I've described above sound impossible. I would have said they were impossible had I not been responsible for bringing them about. Despite the seeming impossibility, the results are both repeatable and easy to obtain, as anyone who sees the video will conclude. Yet, to me, they remain utterly inexplicable, and now I have no explanation at all for how the Marinov Motor works since I do not understand how Newton's third law can be violated in this case nor just where it is that the reaction forces are hiding themselves.

Furthermore, examples of which I've included in the video, I have constructed working motors that can easily do 1000 rpm even in their crude, handmade state, but now I have absolutely no idea what the magnets in the rotors are pushing against to make them turn.

I doubt Marinov ever noticed any of this craziness or he would have mentioned it. I don't know if it should be called the Marinov Motor anymore. I've been referring to it as the "Warlock's Wheel" for the past couple of weeks. The name seems entirely more appropriate.

So, now having confessed cluelessness and declared the hypothesis in my *IE* #19 article thoroughly falsified, I have to get back to work.

Jeffery D. Kooistra
Grand Rapids, MI

•—•—•

The following are comments from our online guest book and www information site.
http:/ / www.infinite-energy.com

"Seems to be a well-organized approach to the new energy experiments and devices. I feel that this country is on the threshold of a new source of safe, clean and cheap energy and we have to break the political ties to fossil fuels and reliance on other 'unfriendly' nations for our energy supplies." Jim Solomon

"Well presented, easy to navigate. Of course, it's thrilling to read about the latest technology from the horse's mouth... More articles suitable for 'lay' readers, perhaps?" Robin Green

"It is hard for me to believe everything you say about thermal efficiency in the electrical/water brake motor. This breaks all rules of thumb. I really want to believe this and I need much more time for it." Halldor Hjartarson

"We all would love to see this furnace on the market!" Jim and Arlene Manns

"I am just a 'regular Joe' with very limited knowledge on cold fusion. Actually, I believed that it was a dead issue. It is refreshing to see that it is alive and well." Lon Diffenderfer

"I have seen some sites that say cold fusion isn't possibly, but people generally say that about anything scientifically significant to the welfare of our planet. If scientists were not around, we would still be in the stone age." Michael Smith

"You have a fine list of links and research references. I intend to make use of them in the months ahead as I follow developments in this fascinating field. Your introduction to the concept and history of this cutting edge phenomenon is compact, clear to me as a layperson and interesting reading...Had I money to invest, I would think long and hard about putting a bet on cold fusion. The real question would be, who has the ideas and the staying power to hold on until the payoff comes... I would enjoy a little more detail in the description of theories being advanced to explain the phenomenon. I would also like to see some graphics and maybe a java-applet animation or two just to spice up the pages and help to visualize the material. Doug Taylor

Omission from Issue #19.
The article: "AquaFuel: An Example of the Emerging New Energies *by Ruggero Maria Santilli* was reprinted from *Hadronic Journal Supplement*, Vol. 13, pages 1-22, 1998.

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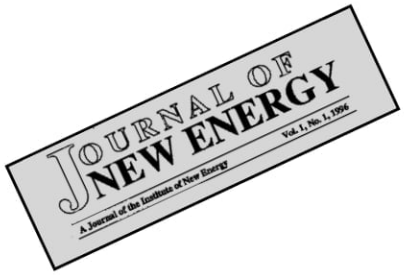

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"All that is necessary for evil to triumph is for good men to do nothing." —Edmund Burke

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Do-It-Yourself Cold Fusion Experiment

Boiled Lightning—from Japan, with Love

by Eugene Mallove

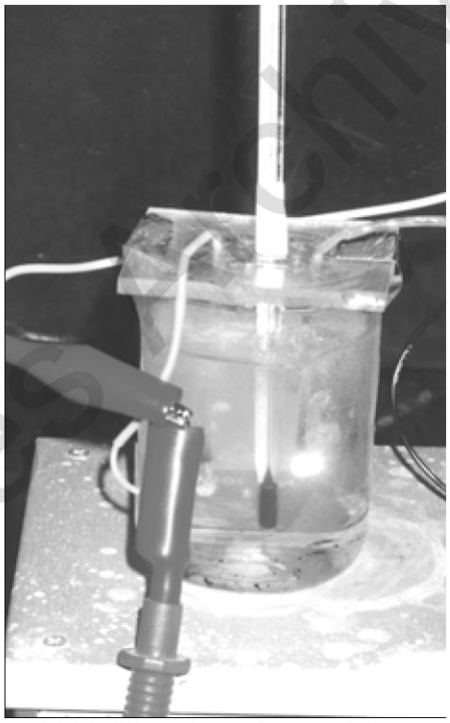
As many *Infinite Energy* readers know, we were sorely disappointed with the official Japanese cold fusion program (the "New Hydrogen Energy" or "NHE" program)—especially with its demise, which we had predicted. The NHE program was fraught with technical incompetence. Our contention has been that some of the best work in Japan is being done by researchers in universities and at companies, research that was ignored by the now defunct NHE program.

It looks as though our assessment was correct—in a big way. At the recent Seventh International Conference on Cold Fusion (ICCF-7), Drs. T. Ohmori and T. Mizuno of Hokkaido University reported a new type of cold fusion—a low-energy excess heat and transmutation experiment that looks tailor-made to spread like wildfire. It is a perfect do-it-yourself electrolytic cold fusion project, for university researchers, high-school laboratories, home experimenters, and budding cold fusion entrepreneurs.

When we heard Dr. Ohmori speak at ICCF-7, we were thrilled to hear that his electrochemical experiment with a tungsten cathode in potassium carbonate (K_2CO_3) solution (0.5 molar concentration) yielded not only excess heat beyond the input power, but also an intense incandescent glow. Ohmori and Mizuno say in their ICCF-7 paper, "This result has an important significance in that the excess energy of some 100 KW is easily obtainable if we use an electrode of *ca.* 1,000 cm^2 and an electric source of the order of 100 KW." We like that kind of talk from cold fusion researchers! We hope they are right.

BUT—a word of WARNING right up front: This is potentially VERY DANGEROUS work and must not be done without maximum, safety precautions and supervision by those thoroughly versed in laboratory safety! It involves high-temperatures, high-voltages, explosive mixtures of oxygen and hydrogen, caustic solutions, and steam generation that if improperly contained could cause a deadly explosion. These are just the beginning hazards. This is unknown territory. Drs. Ohmori and Mizuno measured the transmutation of elements in this experiment. Thus, until further notice—and despite your possible skepticism about this claim of transmutation—this work must be considered, *by definition*, nuclear experimentation. With that said, we encourage every thoughtful group who can do this experiment *safely* to attempt it. *Infinite Energy* and Cold Fusion Technology, Inc. take no responsibility for the known or unknown radiation or other hazards that are associated with this experiment.

At the American Nuclear Society meeting in Nashville, Tennessee in early June (see report in this issue, page 18), I met my colleague, chemist John Thompson of Nassau, Bahamas, who showed me a video tape of his confirmation of the visual and loud audible effect of the Ohmori/Mizuno experiment. I was hooked. For the record, to our knowledge John Thompson is the first person in the world to have replicated Ohmori/Mizuno's work.



A 250 ml Pyrex beaker with an alcohol thermometer suspended from a perforated plastic cover is used to demonstrate the spectacular underwater incandescence of the "Ohmori-Mizuno Effect" at the laboratory of Cold Fusion Technology, Inc. in Bow, New Hampshire. With a tungsten cathode (right side, glowing), a platinum anode (left side, evolving oxygen bubbles), and an electrolyte solution of potassium carbonate anyone with a suitable DC power supply can demonstrate this effect. (Photo: EFM)

[*Infinite Energy* readers who do not perform the experiment themselves but who want to experience the sights and sounds of this wonder, please send $15.00 for a VHS (NTSC) video tape of Thompson's experiment, plus our own initial experiments confirming the effect—P.O. Box 2816, Concord, NH 03302-2816; send US $20.00, if not in North America.]

For completeness, we have included in this issue of Infinite Energy the entire Ohmori/ Mizuno ICCF-7 technical paper on this experiment (pages 14-17).

After working to get it right in our own laboratory here in Bow, New Hampshire, engineer colleague Ed Wall and I now believe we have what appears to be a marvelous "do-it-yourself" cold fusion experiment. Any reasonably equipped chemistry or physics laboratory could see the effect within hours to a week, if it wants to. The experiment has the following qualities:

1. It is visually and audibly spectacular—brilliant glowing, pink, purple, lavender with white flashes on an underwater tungsten (W) electrode. One can use, for example, a 2 mm x 5 mm thin tungsten foil or a 1 cm x 1.6 mm diameter (1/16 inch) piece of a tungsten welding rod (more readily available than the foil). A plasma-like underwater discharge appears on the electrode that often manages to disintegrate or melt tungsten underwater with only about 50 to 80 watts of power over a short period. (Tungsten's melting point is 3680 K or thereabouts.) The sound of the underwater "explosions" on the cath-

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ode—brilliant white flashes on the pink-purple background plasma—is very impressive.

2. It is totally reproducible at will with no hydrogen loading time as in the original Pons and Fleischmann Pd/Pt/LiOD/heavy water experiments.

3. Calorimetry is simple to do, because there is so much steam violently ejected from the reaction that by simply adding up the amount of water vaporized as steam, one gets *apparent* over-unity (O/U—more power out than input). Three groups have already gotten O/U results: 1. Ohmori and Mizuno in Japan, who introduced the phenomenon at ICCF-7 (Output/Input estimated by them at 2.6/1); 2. Gene Mallove and FAA engineer Ed Wall here in Bow, NH during the last weeks in June—work is continuing (conservatively, Output/Input= 1.4/1, if no mistake has been made); 3. Engineer Mark Hugo of Northern States Power in Minnesota (but his affiliation has nothing to do with his home experiment)— (conservatively, Output/ Input = 1.5/1). Chemist John Thompson, the first person outside of Japan to reproduce the effect will do calorimetry on it soon.

Close-up of Ohmori-Mizuno cell in our lab with bright plasma-like incandescence fully developed around the tungsten cathode. Platinum anode (right side of cell) continues to generate copious oxygen gas. *(Photo: EFM)*

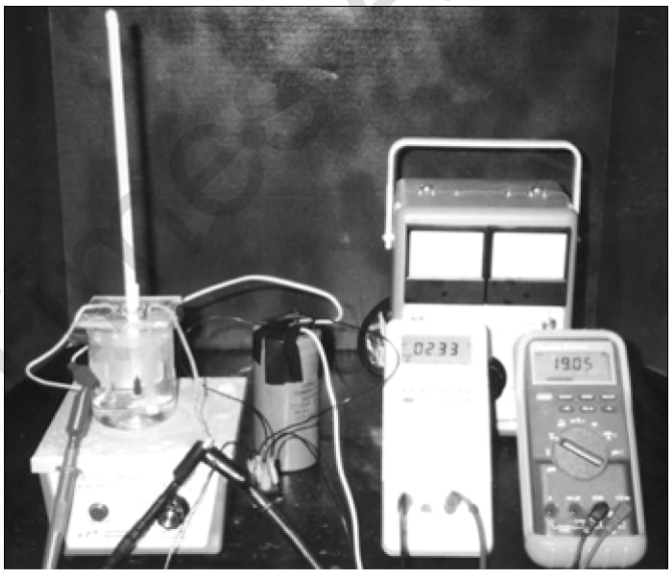
4. No one has patents or may be able to get them since the effect was noticed in other forms (1916!) and reported extensively in the *Journal of the Electrochemical Society*, April, 1950, p.133 in an article titled ("The Anode Effect in Aqueous Electrolysis," by Herbert Kellogg of the School of Mines, Columbia University, New York.) Our colleague Hal Fox, of the Fusion Information Center in Salt Lake City, tracked down this marvelous article, since it relates to some of the work his Trenergy corporation is doing. See his comments on the "Ohmori Effect" beginning on page 13. He relates the effect to Ken Shoulders' charge cluster work. This Ohmori effect clearly is also related to the underwater electrolysis ability to remediate nuclear waste, which The Cincinnati Group, Hal Fox, and others have verified.

Even though the "Anode Effect" and "Cathode Effect" were known long before cold fusion became an issue in 1989, no one bothered to do calorimetry on the system. Why would they? No one had *any idea* that such simple electrochemical systems could possibly appear to have energy emanating from them that exceeded input power—much less dream that element transmutations might be occurring in water-filled glass beakers! The systems were studied for other reasons. The present tungsten effect is seen mainly on the cathode, but it can make the Pt anode incandescent too at lower water temperature (say 50 °C) —we have normally worked in the temperature range over 80 °C in our initial experiments. The whole business is very mysterious and pregnant with possibilities for frontier scientific investigation.

5. Ohmori and Mizuno found major evidence for transmutation of elements and volcanic ejection of metals from the tungsten surface—these SEM photos were reproduced in their article (see the details in their paper). They find Hg, Os, Kr, Zn, Cu, Ni, Fe, Cr, Si, and Mg, and the metal Pb with very anomalous isotopic composition. Just as I said, in *Infinite Energy* #15/16, this subject should more properly be called "Electro-Alchemy."

6. WARNING: Ohmori and Mizuno experienced significant apparent electromagnetic effects on their instruments. They were unsure whether some of the effect on their neutron counter was evidence of a massive neutron flux. I doubt the latter, as did Dr. M. Srinivasan, formerly of India's Bhabha Atomic Research Center (BARC), who made his remark at ICCF-7. Concerning ionizing radiation safety issues: We have kept a Geiger counter on during portions of our experiments with absolutely no sign of ionizing radiation, but of course such radiation could be localized within the cell. Also, a Geiger counter does not detect neutrons.

Ohmori and Mizuno's paper at ICCF-7, though reprinted here, will also be included in the proceedings: "Strong Excess Energy Evolution, New Element Production, and Electromagnetic Wave And/Or Neutron Emission in the Light Water Electrolysis with a Tungsten Cathode."



Ohmori-Mizuno Cell on Cole Parmer heating assembly (no magnetic stirring was used). The heating plate may be used to speed up getting to the 80 °C operating temperature, or the cell may be warmed by lower voltage electrolysis. Large electrolytic capacitor and solid-state bridge rectifier from Radio Shack are in the middle. Variac power supply (5 amp, 150 volts, max) with panel meters is behind current and voltage measuring instruments. *(Photo: EFM)*

Doing the Experiment

Here is our recommended recipe for an experiment to demonstrate their effect:

1. Start with a 250 milli-liter glass beaker, fill to about 200 ml level with 0.5 molar K_2CO_3—0.5 M potassium carbonate solution. (That means putting 138.2 grams of K_2CO_3 powder in a beaker, and adding pure distilled water to form a final volume of 1.0 liter—or any volume desired using proportionately less powder.)

2. Use 0.5 mm diameter platinum (Pt) wire for both anode and tungsten (W) cathode leads—about 15 cm for each lead is adequate length. Diameter and length are not critical. Pt is a very good lead for electrochemical experiments due to its nonreactivity and ductility, but it is expensive. (You might be able to get some from a local jewelry repair shop.) Shield the leads with teflon or other plastic insulation tubing down to the connection point with the Pt anode or cathode, to prevent reactions occurring on the leads themselves.

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3. Use a small piece of Pt foil—about 2 mm x 5 mm on the anode (positive lead) crimped mechanically to the Pt wire—no welding is needed. Pierce the Pt foil with the Pt wire to hold it on (any thickness of foil will do).

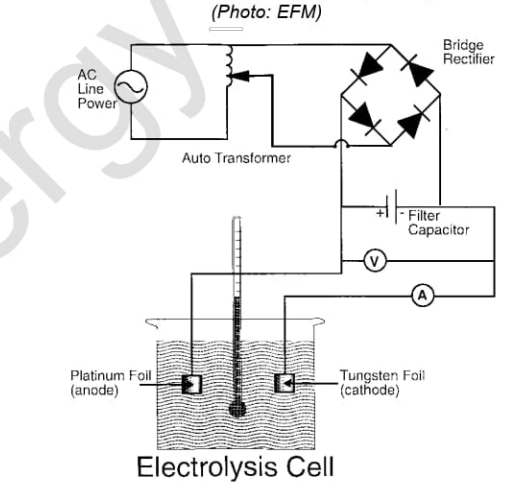
4. Use a 2 mm x 5 mm size tungsten (W) foil on the cathode —the negative side. It is tricky to attach the W foil. We used 0.1 mm thick foil, which can be pierced with difficulty and the Pt lead wired through several holes. Or, if W welding rod 1/16-inch diameter is available (it comes in both pure and thoriated forms), wrap the Pt wire around the W piece about 0.5 to 1 cm long. Warning: The reaction is so violent that it is hard to get the cathode piece, if in rod form, not to fall out of its Pt wire cage! Runs up to 10 minutes long will usually retain the rod, but our impression is that the W rod begins to wiggle out of its Pt cage as its surface is damaged in the processing. (Note well: If the reaction is not seen *immediately* when the elevated temperature and voltage recommended are achieved, this means that the cathode is likely too big in surface area compared with the Pt anode. Remove the cathode from solution and trim it down in size in stages until the effect occurs.)

5. Get a DC power supply of up to 5 amps capacity and up to 200 volts. (We are eager to try beyond 180 volts, but we may want to have ready a concrete bunker before doing that. We are eager also to try heavy water.) You can use a variable AC power source (a "variac") to create DC, but use a bridge rectifier and capacitor to make DC from the AC output. [See attached schematic of circuit we used.) Install voltage and current metering devices—digital displays preferred, or a data acquisition system if you later want to get fancy with the calorimetry. Input voltage times input current at each instant (VxI or volts times amps) is a measure of the *instantaneous* input *power* (watts) to the cell. This power, multiplied by the small time interval that it has that exact value, is a measure of the input *energy*—watt•seconds, or joules—during that interval. If the voltage and power are relatively constant during a longer period of time, average values of V and I can be used to estimate input energy. (For accurate work and ultimately to present convincing evidence of an O/U effect, accurate computer integration of VxI with respect to time must be performed by computer data acquisition.)

6. Heat up the beaker solution to 80 °C either by electrolysis at low DC input power, *e.g.* 20 V, 1.8 to 2 amps, or with an external laboratory hot plate. (Turn off the hot plate and remove it for the actual run, if calorimetry is being used. You do not want to have any external heat source affecting the results.) At about 80 °C and sometimes at a lower temperature, you can crank up the volts to 120 to 180. The effect changes appearance as voltage increases. It starts as a purple-white glow bordering the edges of the cathode. Then as voltage is increased, the effect consumes the entire cathode and the pink-purple glow is seen, together with very loud boiling sounds. Current will drop substantially and automatically to 0.2 to 0.4 amps, as the sheath of steam surrounds the glowing plasma-sheathed cathode. Keep an alcohol thermometer suspended in the solution to measure the temperature. Avoid thermocouples for the time being, because of the threat of violent electromagnetic interference from the unknown phenomena.

Analyzing the results in a calorimetric assessment: Heating credit should be taken for the full mass of water in the cell from the initial temperature of say 80 °C to the boiling point. However, you may find it difficult to push the average solution temperature up to 100 °C (boiling point of water at standard sea level pressure), because the steam ejected cools the solution so rapidly. (The boiling point is raised slightly because of the electrolyte.) The abundance of steam is wonderful, because we *want* steam. It will be no problem at all to power steam engines with this if we can figure out how to get the power ratio high enough—if it is not there already. The main source of the excess energy is the amount boiled off: to vaporize water requires about 2,268 joules/ gm.

Engineer Ed Wall (L), on a "working vacation" in our Bow, New Hampshire laboratory, helps to construct our first attempt to duplicate the Ohmori-Mizuno effect. Dr. M. Srinivasan ("Chino"), former head of the Neutron Physics Division of the Bhabha Atomic Research Center in India (BARC), looks on. *(Photo: EFM)*



Schematic of Electrical Circuit Used in our Ohmori-MIzuno experiment (Artwork: Jeremy Slayton)

Why was this missed by other cold fusion people? Simple: Everyone was looking for the relatively sedate reaction with which Pons and Fleischmann had started, when in truth the real pay-off might have been in these higher voltage systems that trigger with metals like tungsten. W is recommended due to its temperature resistance, but John Thompson has found that other metals such as Al, Cu, Ni, and Zr also work— as far as providing a *visible* effect. Other colors emerge in the plasmas surrounding those metals.

Other parameters that could be explored and objectives to reach:

- Employ higher voltages.
- Can energy be extracted from the recycled water *after* steam condensation by a standard lab condenser? Or if Dr. Mills-type hydrinos (hypothesized shrunken hydrogen atoms) are formed, do they become "inert"? (see in *IE* issue #17 the interview with Dr. Randell Mills).
- Try other electrolytes, such as the Na_2SO_4 used at times by Ohmori/Mizuno. KCl also works, according to John Thompson.
- Try higher and lower molarity value—concentration of electrolyte.
- Try other metals such as Cu, Al, Ti, Zr, Au, Pt, or Pd.
- Explore pressurized systems—BE CAREFUL!!! This is NOT for amateur use and the HIGHEST SAFETY precautions against deadly explosions must be in force.
- Recombine oxygen and hydrogen produced by the cell. Even though this is possibly a very small part of the energy output of the effect, one can't be sure. This is a new regime to be explored. The intense plasma near the cathode may have ripped apart water molecules and left a store of unaccounted for chemical energy in the output gas.

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• Try heavy water in various mixtures with light water.
• Detect electromagnetic pulses from the device—if it is there as Ohmori and Mizuno may have found in Japan. It may be possible to pick up this emission on an AM radio.
• Examine the element production and non-natural isotope ratios formed.
• Employ scanning electron microscope (SEM) imaging to explore the morphology of metal craters in the metals used.
• Look for radiation—use film fogging techniques (dental film or Polaroid™ packs), CR-39 plastic charged-particle track detectors, etc.

This will keep a lot of people busy for a long, long time. As soon as we pin down the thermal characteristics a bit more, we will be hell-bent here to scale up to larger power-producing units—with SAFETY FIRST our motto.

To illustrate data from a typical O/U-indicating run in a uninsulated glass beaker on a metal surface, this is a very rough calculation—conservative, we think. Among other factors reducing the effect apart from ZERO insulation of the cell is the recondensation and re-boiling of material. We had a plastic cover on the beaker with holes drilled in it. A distillation recondensation device would be preferred to observe water evolved as steam:

The more you look the more there is to see...
—Ed Wall, replicating Ohmori-Mizuno experiment in Bow, NH

Input: 0.7 to 0.8 amps, avg 0.75 A input at 168 volts.

Duration: 3 minutes, 31 seconds. Therefore, input energy = 26,590 joules (= 0.75 x 168 x 211).

Solution reduced from 183 ml to 173 ml due to boil-off. Therefore, Output = 10 x 2259 joules/gm H_2O + 183 x (15 °C rise during heating to full boiling at about 92 °C) x 4.18 joules/gm °C = 34,060).

Output/Input = 1.28. However, if we believe that the system was only 90% efficient in converting the input power plus potential excess power source to measured output (conservative assumption), the O/I might be more like 1.42.

A Negative Report

Just as we went to press we received this communication from Dr. Jean Paul Biberian in France, an indication of a negative result: "We have tried a replication of Ohmori's experiment at our lab in Grenoble. We have performed two experiments in a Pons and Fleischmann type-cell, with a platinum anode wrapped around a cathode, first a 2mm diameter by 12 mm long platinum cathode, then a tungsten cathode 1 mm diameter and 25 mm long. we used K_2CO_3, 0.5 molar.

"At low temperature the conductivity is high with 10 volts and 5 amp. After 10 minutes, the voltage increased to 160 Volts, and the current dropped to 0.6 A, later it went up to about 1.2 amps. A bright discharge was permanently there with regular bursts of light, noise and current intensity.

"We stopped the experiment after 10 minutes, but a crude calculation of the amount of heat necessary to evaporate the 35 cc of electrolyte gave no excess heat.

"Interestingly, the tungsten cathode was etched, and had a clean shinning surface, whereas the platinum cathode of the first run looked rough.

"The platinum anode of the tungsten experiment melted at four different places, we believe in sequence, first at the bottom, then near the top.

"We have analyzed by X-ray fluorescence the two cathodes, but have not observed any new elements within the sensitivity of this type of instrument, *i.e.* about 1%.

"We are open to comments." —Jean-Paul Biberian

A Positive Report

Then we received this positive report on "W systems" from Dr. Cravens in Cloudcroft, New Mexico:

"I just got a copy of 'anode effect.' FYI the system that was shown at the Nov. ANS (American Nuclear Society) meeting (Here in NM) use such a system. I had three metal configurations. 1.) Pt and Zr (actually Zr with about 3% Hf—the cheap stuff from Alfa-Aesar)—that was for visual effects (it gets very bright). This was in a clear glass tempering beaker with a refrigerated constant temperature water flow to keep it cool, 2.) Pt and W (actually W with 2% Th—Anchor Brand welding rod), in a dewar flask with a stir bar to check temperature rise in a set time, and 3.) a backup system using Pt plated Ti for the anode and a W/2% Th anode.

"I seem to get slightly better effects with the Th-loaded W welding rods and Dennis Letts has been using La-doped rods. The comments about radiation effects (I am still unsure if it is EM or alphas or low energy betas since it shields easily.) are about right. The effect is most noticeable when first turned on. You can pulse the current to enhance the effect (I use about 0.1 to 10 Hz chopping).

"The system does not have to be at 100 °C to see the effect. I often work at around 60 to 80 °C (since it boils around 93 °C here). However, when you work at or near boiling, the action at the cathode will induce an AC component to the current. You are advised to watch the AC components even when working with a DC supply or your input will be off (this can be up to a factor of 2 or so).

"The cheapest way seems to use a light dimmer switch and rectifier bridge. This gives you about 120 volts with peaks much higher. If you search you can often get 220 Volt systems (designed for Europe). I often use a 110 to 220 step up transformer to drive the system via a bridge diode.

"Recap: If you want to look for radiation try to pulse/chop the input and use good meters to monitor the input power.

"These systems are typically 20 to 30% excess when they are working. It may sound funny (pun intended), but you can hear them when they are working. You get used to the correct sound - it is a kind of pulsing humming.

"They seem to work with K or Li salt, but not with Na????? I have tried to spike them with D_2O, but no real difference [seen]. Inter-transition metals (*i.e.* rare earths + Th + U) sometimes help."

Mysteries Observed in 1950 and Earlier

Several interesting observations and questions about this basic electrochemical regime in water electrolysis were reported earlier this century. The paper by Herbert H. Kellogg of the School of Mines at Columbia University, "Anode Effect in Aqueous Electrolysis," was delivered at the Cleveland meeting of the Electrochemical Society, April 19-22, 1950. The paper appeared in the April, 1950 issue of the *Journal of the Electrochemical Society*. The paper's abstract:

"A phenomenon which closely resembles the 'anode effect' in molten electrolysis can be developed in the electrolysis of aqueous solutions at high current density. Normal operation of the electrode ceases and a so-called 'transition period' begins when the electrode temperature reaches the boiling point of the electrolyte. When the applied voltage is increased beyond a critical value, the transition behavior suddenly changes to the 'aqueous anode-effect.' During this effect, the surface temperature of the anode rises far above the boiling point of the electrolyte. Evidence is provided which indicates that the gaseous envelope surrounding the anode during the aqueous anode-effect is maintained by the vaporization of the electrolyte against the hot

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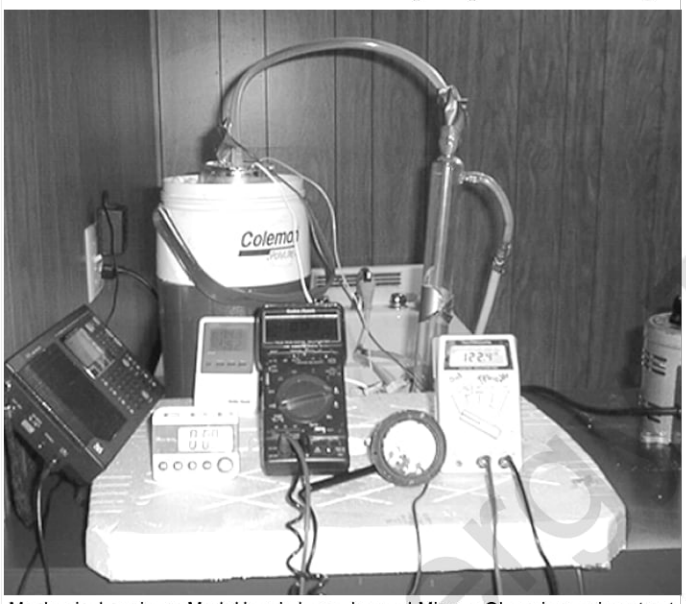
anode surface. An aqueous cathode-effect was also obtained. The relation between aqueous anode-effect and anode effect in molten media is discussed."

The paper points out that "many investigators have attempted explanations of this troublesome phenomenon." Kellogg notes that earlier (1925), C.S. Taylor (*Trans. Electrochem. Soc.*, 47, p. 301, 1925) had described the anode effect, which surely applies to what we are seeing in the Ohmori/Mizuno cell *cathodes*: "The anode, during the normal course of electrolysis, is surrounded with a large number of gas bubbles which are constantly escaping from it. These small bubbles seem to form on the anode, and then break away easily and escape from the electrolyte by breaking through the surface film. This smooth, even evolution of gas around the anode is always a sign of normal operation. The moment the anode effect occurs, however, conditions are entirely different. The anode appears to be entirely surrounded by a film of gas, which, by covering the surface of the anode, pushes the fused electrolyte away, and thus produces the so-called 'non-wetting' of the anode. As the electrolyte is pushed away, small arcs form between the electrolyte and the anode."

After much discussion of the complex patterns of the gas



Mechanical engineer Mark Hugo's home-brewed Mizuno-Ohmori experiment set up in his kitchen laboratory. He uses a glass water-cooled condenser to collect the boiled-off water vapor from the electrolytic cell. *(Photo: by Mark Hugo)*

layer and current, voltage, and temperature of the anode-effect in aqueous solution, Kellogg delves into the "aqueous cathode-effect": "...With cathodes, however, there is yet another phenomenon that takes place. If the solution contains sodium sulfate, or if sodium hydroxide is used as the electrolyte, the "cathode effect" is not obtained. Instead, the cathode surface is covered with a multitude of what appear to be spark discharges (blue color), no wide vapor film develops, and the surface of the cathode remains at 100 °C or slightly lower. Apparently, some kind of film does form around the cathode, because the meniscus at the electrolyte surface dips down, just as in the 'cathode-effect' or the anode effect. However, the wide-vapor-envelope which can be clearly seen during the true 'cathode effect' is absent in this case. The explanation of this phenomenon lies outside of the scope of this paper, but the writer feels that *a different mechanism of electric conduction between electrolyte and the electrode surface is probably responsible for this phenomenon."* Sad, but perhaps true, if this capable author had explored this latter observation in more depth, he might eventually have leapfrogged and found an excess energy phenomenon—"cold fusion," ahead of its time, in the 1950s.

The author revealed his knowledge of yet another mystery surrounding the molten electrolysis "anode effect," which might well apply to the cathode phenomenon at issue today: "...One is forced to explain how a small amount of gas will cause a gaseous envelope to form, where five or ten times that amount of gas was unable to do so. Second, *it is not hard to show by means of hydrodynamics that the velocity of gas required to hold back the electrolyte from the anode, at any reasonable depth in the electrolyte, is very large and far more than one could obtain from molten electrolysis."*

COMMENTS ON THE "OHMORI EFFECT"

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ABSTRACT

The valuable discovery of the "Ohmori Effect" is explained, in part, by the "Anode Effect" previously reported in the literature. A heated electrode in an aqueous solution can provide sufficient heat to maintain a vapor barrier between the electrode and the electrolyte. Under proper conditions, the voltage drop across the vapor produces a sufficient electric potential gradient to produce high-density charge clusters.

BACKGROUND

Herbert H. Kellogg[1] reports on the "anode effect" and provides compelling experimental evidence and logical evaluation to convince the reader of the ability of a heated electrode to maintain a vapor barrier in an aqueous solution at atmospheric pressures. In the case of the Ohmori Effect, the production of excess thermal energy appears to be an unexpected anomaly [5]. Ohmori reports the observation of sparking, electrode glowing, and the production of excess thermal energy. For a more comprehensive, but not exhaustive review of electrode sparking, see Bhadkamkar *et al.*[6]

COMMENTS ON THE "OHMORI EFFECT"

When a pair of electrodes are placed in a conductive aqueous solution the following phenomena can be observed: 1. The heating of the electrolyte by Joule heating; 2. The production of evolved gases (especially oxygen and hydrogen); 3. The increase of electrolyte conductivity with an increase in temperature;[1] 4. Electrode luminescence is observed in some anodized metals. There is seen an increase in visible light with an increase in applied voltage[6]; 5. With some electrodes, sparking is observed as the voltage is increased;[6] 6. With sufficient heating of the electrode (resistance heating by large currents), vigorous agitation, the formation of vapor, and a drop in current will be observed[1].

As reported by Bhadkamkar *et al.*[6] a class of metals form a high resistance oxide layer and have been studied for their electroluminesence. In most cases electroluminesence increases with voltage and, at some voltage, produces "sparking." It has been hypothesized that such sparking involves the production of high-density charge clusters by field emission from the metal/metal-oxide layer. The possibility of charge-cluster participation in nuclear reactions has been discussed by several authors.[6,7,8,9,10]

High density charge clusters can be formed in aqueous solutions by providing a suitable voltage drop across a meta/metal-oxide layer. Due to the local destruction of the metal oxide,

Fox continued on page 17

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Strong Excess Energy Evolution, New Element Production, and Electromagnetic Wave and/or Neutron Emission in Light Water Electrolysis with a Tungsten Cathode

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ICCF-7 Paper

ABSTRACT

Strong heat evolution, enough to incandesce the electrode, was observed by applying a high electric power. The excess energy amounts to 183 W, which is 2.6 times the input power. At the same time, strong electromagnetic wave and/or neutron emission reaching 60,000 counts/sec by a neutron counter was observed. During the electrolysis, considerable amounts of new elements, *ie*. Pb, Fe, Ni, Cr and C were produced. The distributions of Fe, Cr, and C on/in the electrode were overlapped. The isotopic distribution of Pb deviated greatly from the natural isotopic abundance. These results show that the nuclear transmutation reaction took place on/in the tungsten electrode during the electrolysis.

INTRODUCTION

In several reports published recently, it has been demonstrated that many kinds of new elements, e.g Hg, Os, Kr, Zn, Cu, Ni, Fe, Cr, Si, Mg with anomalous isotopic contents were produced during the cathodic electrolysis in Na_2SO_4 and Na_2CO_3 light water solutions.[1-7] We concluded on the basis of these results that some nuclear transmutation reactions take place, which initiate by an interaction among protons (or H atoms), electrons and electrode material atoms via neutron formation, and the products successively disintegrate to form above elements. In order to withdraw greater nuclear energy utilizing these reactions, it seems favorable to select a metal with high mass number as an electrode material, since it has a smaller binding energy per nucleon.

In the present study, we chose tungsten as an electrode material and conducted light water electrolysis by applying high electric power. To our surprise, we observed a strong excess energy evolution to such an extent that this electrode became incandescent and an intense electromagnetic wave and/or neutron emission occurred concomitantly. In addition, fair amounts of C, Cr, Fe, Ni and Pb were produced on/in the electrode during the electrolysis. In this report we will show the results and discuss some possible nuclear reactions.

EXPERIMENTAL

The electrolytic cell was a flat-bottomed fused quartz vessel with a silicone rubber stopper equipped with a working electrode, a counter electrode, a thermocouple and an alcohol thermometer. Tungsten electrode used was a flag formed plate connected with a tungsten lead wire. The counter electrode was a platinum gauze. The electrolyte solutions were 0.5 M Na_2SO_4. In addition, 0.5 M K_2CO_3 was used in the analysis of the emission from the incandescent electrode. Both solutions were prepared from Merck super-pure grade reagents and Milli-Q water. The impurities contained in the Na_2SO_4 solution are Ba (0.2 - 0.1 ppm), Si (0.1 - 0.01 ppm), K (0.01- 0.001 ppm), Li, Mg, Ca, P, Sr, Cr, Fe, Co, Ni, Cu, Zn, As, Hg, Pb (0.001 - 0.0001 ppm), Ti, Mn, and Cd (< 0.0001 ppm). The impurities contained in the platinum gauze are Rh (18 ppm), Pd, Cr, Si (2 ppm) Cu, Fe, B, and Ca (< 1 ppm). The amounts of Fe and Cr in tungsten are 0.003 and 0.001 ppm, respectively. The volume of the electrolyte solution is 120 ml. The electrolysis was conducted in an air thermostat controlled at 20 ± 1° C . The temperature of the solution was followed by both thermocouple (alumel-chromel type) and an alcohol thermometer. The former was inserted into a quartz glass sheath containing silicone oil at the bottom and the latter was coated with Teflon film. The electric power was supplied by either of the regulated DC current/voltage supplies with 160 V or 240 V maximum output potential. The analysis of the emission from the electrode was made using a portable neutron REM counter (Fuji Electric NSN-10014) which was placed at a distance of 30 cm from the electrolytic cell. The product elements were analyzed by energy dispersive X-ray analyzer (EDX), electron probe micro analyzer (EPMA), and secondary ion mass spectrometry (SIMS).

RESULTS AND DISCUSSION

Under the electrolysis condition at potentials below 120 - 40 V, only a conventional evolution of H_2 gas was observed from the working electrode. However, as the potential exceeded the above values, [on] the electrode there began to occur a spark discharge. When the electric power increased up to 160 V, the electrode was heated incandescently and reddish purple glow emerged in the solution around the electrode. Figure 1 shows the incandescent condition of the electrode. The current density was 1.4 + 0. 2 A/cm^2 (0.7 + 0.1 A of current intensity). Such a condition was kept nearly steady during the electrolysis. The temperature of the solution just before the ignition of the elec-

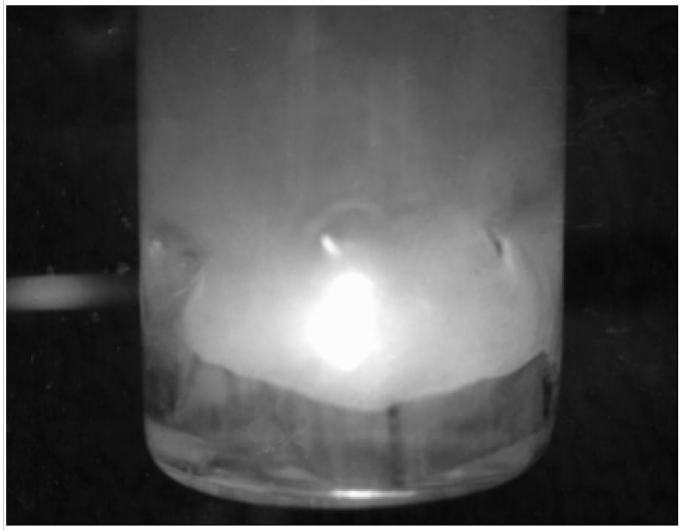

Figure 1. The incandescent condition of the electrode. The white sphere in the middle is the glow. [Editor's Note: Surrounding the white sphere is a bright pink as seen in the color photo in the submitted paper.]

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trode was 80 - 85° C, which, after ignition, started to increase sharply and reached the boiling point within 80 sec. This phenomenon was easily reproduced. The recording of the solution temperature using the thermocouple became impossible after the ignition, owing to strong [electronic] noise. The farther the thermocouple was separated from the electrode, the smaller was the noise level. Perhaps, this has relevance to an induction of electromagnetic wave[s] accompanying the emergence of the glow, as will be described later in detail. It is considered that the electromagnetic wave is caused by plasma emerging by some nuclear reaction. It is surprising that the plasma was formed even in such a liquid phase. The increase in the temperature of the solution after the ignition was followed by the alcohol thermometer.

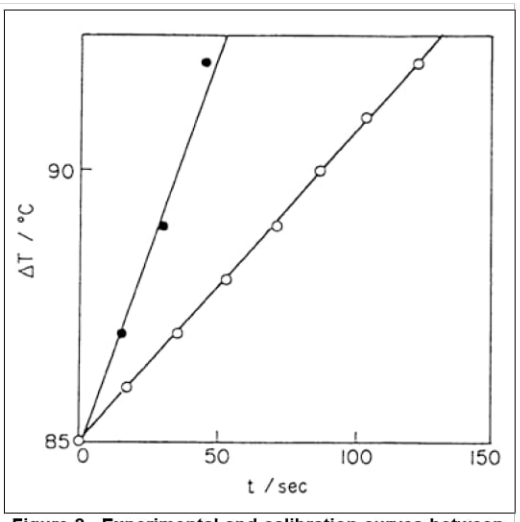

Figure 2. Experimental and calibration curves between solution temperature and input power: (•) experimental, calibration (O))

In order to estimate the excess energy evolved, a calibration curve was measured under the same electrolysis condition as the practical electrolysis by introducing a Nichrome-heater into the solution of the electrolytic cell. The rise of the solution temperature was followed by applying an input electric power, 112 W (0.7 A x 160 V), identical with that applied after the ignition of the electrode. Figure 2 shows experimental and calibration curves in the temperature range corresponding to the rise after the ignition. The rate of the temperature rise of the experimental curve is 0.15° C/sec, being *ca.* 3 times greater than that of the calibration curve, 0.057 °C/sec. Thus, the rate of the total energy evolved from the tungsten electrode after the ignition is estimated at 295 W from the product of the input power and the ratio of the rate of the temperature rise of the experimental curve to that of the calibration curve, *i.e.* 112 W x 0.15 / 0.057. Therefore, the net-rate of the excess energy evolution (hereafter referred to as excess energy) is estimated at 183 W, being 2.6 times the input energy. This result has an important significance in that the excess energy of some 100 KW is easily obtainable if we use an electrode of *ca.* 1000 cm^2 and an electric source of the order of 100 KW.

Under the incandescent condition of the tungsten electrode, strong electromagnetic wave[s] and/or neutron emission was detected. These intensities against input potential observed in the electrolysis in 0.5 M Na_2SO_4 and 0.5 M K_2CO_3 solutions are shown in Figure 3, being in the range of 0 - 15,000 counts/sec for Na_2SO_4, and of 0 - 60,000 counts/sec for K_2CO_3. It is noticeable that the intensities, if they are due to neutrons, are 5 - 6 orders of magnitude higher than the natural value. The emission intensity in K_2CO_3 is *ca.* 100 times that in Na_2SO_4 at a potential of 140 V, which, in both cases, tended to increase nearly exponentially with input potential. Similar behavior was observed in the electrolysis with a platinum electrode.[8] When the potential was reduced to 120 V (for K_2CO_3) - 140 V (for

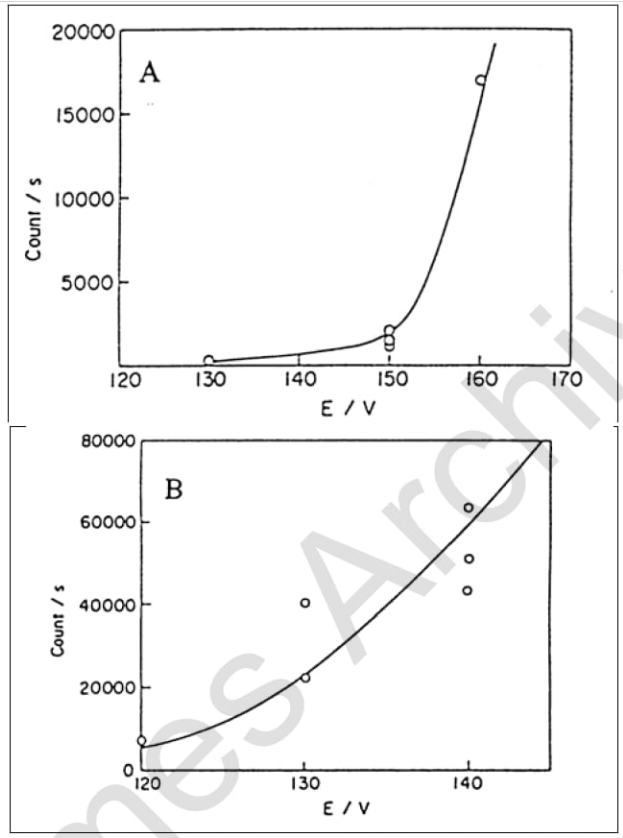

Figure 3. The intensities of emission counted per second from the incandescent electrode using REM neutron counter.

Na_2SO_4) the glow emission disappeared (although spark discharge still continued) and the neutron emission nearly ceased.

Naturally, the electrode surface after electrolysis revealed quite a different structure from that before electrolysis. Figure 4 shows a scanning electron microscope (SEM) image of the tungsten electrodes after electrolysis. One can see that the whole electrode surface changed into a lava-like structure. This shows that the tungsten layers close to the surface have melted as a result of the incandescence. Maybe the temperature rose up to 3000°C or more. In addition, considerable amounts of several new elements were detected on/in the electrode. Figure 5 shows typical EDX spectra obtained from the tungsten electrodes before and after the electrolysis. One can see that significant amounts of Fe and Cr are formed on/in the electrode after electrolysis (Figure 5B). Whereas, only signals of W are observed on/in the tungsten electrode before the electrolysis

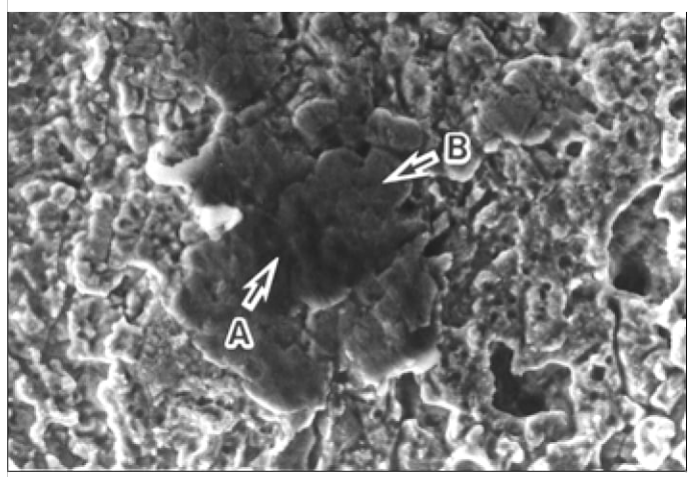

Figure. 4. SEM image of the W electrode surface after electrolysis.

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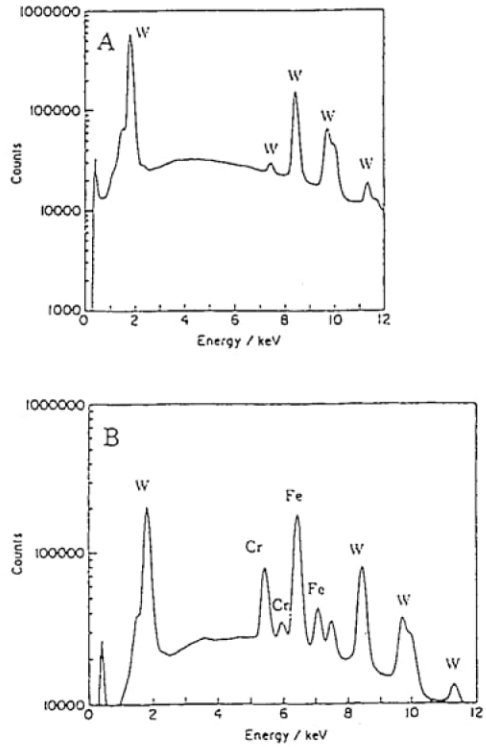

Figure 5. Typical EDX spectra on/in the W electrodes before and after electrolysis: A, before electrolysis; B, after electrolysis.

(Figure 5A). Figure 6 shows EPMA images of the distributions of C, O, Cr, Fe and W on/in the electrode shown in Figure 4. As seen from the images the distributions of C, Fe, and Cr are overlapping and concentrate at the center part of the crater-like structure (point A) visible in the middle of Figure 4. The ratios of Fe, Cr and W to all of the constituting elements are estimated at 67.4, 16.9, and 7.9 atomic % respectively, the contents of Fe and Cr being much greater than W. However, the content of these elements markedly decreases with leaving the center [away from the center] of the crater-like structure and consequently the ratios of Fe and Cr are 6.7 and 1.9 %, respectively, at the edge (point B). It should be noted that Fe and Cr, which are present infinitesimally in the present electrolysis system, are distributed locally only at the center part of the crater-like structure and, besides, exceed by far the amount of W of the electrode material. As we have mentioned already, the contents of Fe and Cr are in the range of 0.01 - 0.001 ppm in the tungsten and platinum materials used as the working and counter electrodes and in the range of 0.001 - 0.0001 ppm in 0.5 M Na_2SO_4 solution. Such amounts of Fe and Cr are undetectable by EDX measurement with moderate sensitivity even if all these atoms are deposited on/in the tungsten electrode surface. Therefore, it is natural to consider that these elements are not impurities but products from some nuclear transmutation reaction. In addition, the overlapping distribution of these elements is not understandable in terms of the electrodeposition from impurities.

The isotopic distributions of Fe and Cr present within a depth of 160 Å of the electrode after electrolysis are 6.1 (4.31) 79.1 (83.75), and 12.4 (9.55) % for ^{50}Cr, ^{52}Cr and ^{53}Cr, 91.0 (91.66) and 2.9 (2.19) % for ^{56}Fe and ^{57}Fe, and 38.5 (25), 55.0 (22), 6.5 (52) % for ^{206}Pb, ^{207}Pb and ^{208}Pb, respectively *(the numerical values in the parentheses are natural isotopic abundance).* In this calculation, the isotopic contents of ^{54}Cr and ^{54}Fe are regarded to be equal to their natural isotopic abundance for the sake of convenience. Contrary to the expectation from the results obtained in light and heavy water electrolysis with gold, nickel and palladium electrodes,[1-9] the isotopic distributions of Fe and Cr are not so much deviated from their natural isotopic abundance. Only the isotopic contents of Pb comprising *ca.* 1 % of the constituent elements of the electrode surface deviate markedly from the natural values. This result shows that the major nuclear products of the nuclear transmutation reaction occurring on the tungsten electrode are ^{56}Fe and ^{52}Cr. In view of the overlapping of the distributions of Fe, Cr and C at the center part of the crater-like structure, it is natural to consider that the Fe, Cr and C atoms were produced concomitantly.

The fact that a large amount of excess energy evolution, enough to incandesce a tungsten electrode and [create] a strong electromagnetic wave and/or neutron emission were observed simultaneously, supports strongly that some nuclear reaction occurred during the electrolysis. Besides, that these results were obtained in the light water electrolysis has a very important significance in that the major nuclear reaction occurring in the electrolysis system is not the conventional ^{2}H - ^{2}H or ^{2}H - ^{3}H [hot fusion] reaction.

As a most feasible starting nuclear reaction, it is expected that the following electron capture reaction takes place at the electrode-solution interface[4],

$$\text{proton (or H)} + e^- \rightarrow \text{neutron} \qquad (1)$$

Under a strong electric field across this interface, a small frac-

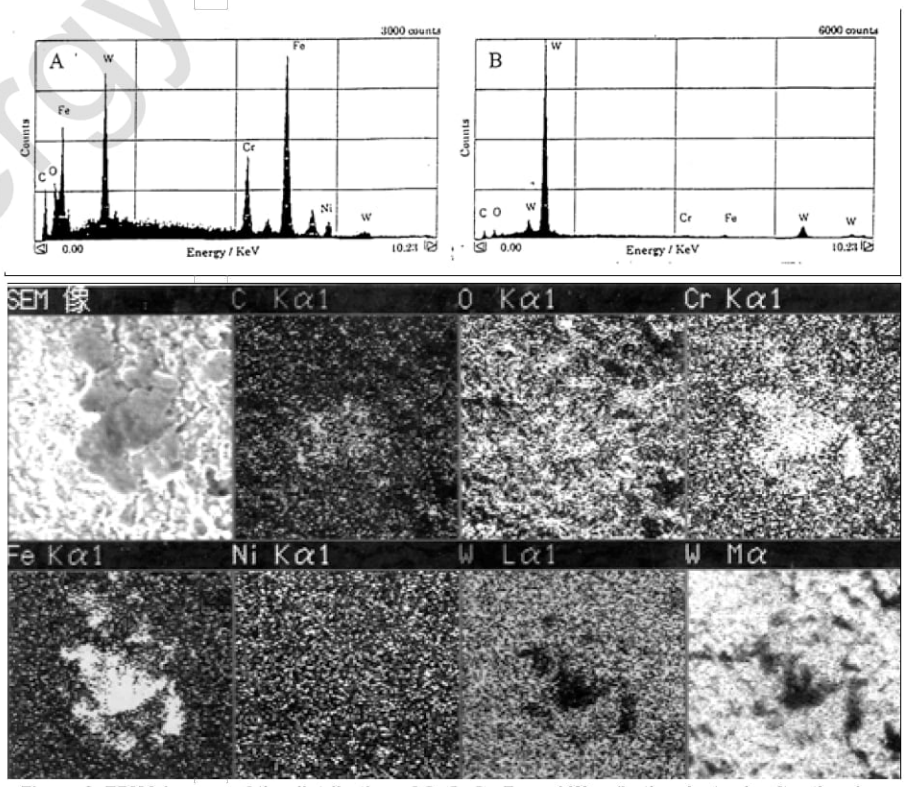

Figure 6. EPMA images of the distribution of C, O, Cr, Fe and W on/in the electrode after the electrolysis. EDX spectra, A and B, correspond to those at points A and B in Fig.4, respectively.

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tion of the electrons exuded by tunneling through the wall of the electric field may happen to have a chance to be captured by protons or hydrogen atoms, although an overwhelming majority of the electrons are consumed by the conventional hydrogen gas evolution reaction. By increasing the electric field, the reaction (1) would rapidly accelerate, which may be possible to cause an exponential increase of the neutron emission as shown in Figure 3. The greater part of the neutrons thus produced would be captured by tungsten atoms of the electrode material, for example, as follows,

$$^{182}W + n \text{ (neutron)} \rightarrow {}^{182+n}W \qquad (2)$$

Only part of neutrons emit out of the electrolytic cell if the emission detected by the neutron counter is due to neutrons. The $^{182+n}W$ thus produced is unstable, disintegrating immediately to form Fe, Cr and C, for example, by the following reaction:

$$^{184}W \rightarrow {}^{56}Fe + 2\,{}^{52}Cr + 2\,{}^{12}C + 12\,\beta^- \qquad (3)$$

From the EPMA images shown in Figure 6, it is clear that these nuclear transmutation reactions have occurred locally on/in the tungsten electrode and, as a result, the crater-like structure has been formed at that part. Perhaps, the reaction (1) would occur at a specific part of the electrode where the electric field forms extremely strongly. It is expected that a fair amount of X-rays are emitted out of the electrolytic cell if the reaction model is valid. So far, some reliable X-ray observations have been made for Pd and Ni electrodes.[6, 11-12]

The reality of the low temperature nuclear reactions in the light water electrolysis system is strengthened to a great extent by the present study. To draw a crucial conclusion for this issue, more detailed analysis of the emission from the incandescent electrode is absolutely necessary.

References

1. T. Ohmori, T. Mizuno, H.Minagawa and M.Enyo, *Int. J. Hydrogen Energy*, 27, 453 (1997).
2. T. Ohmori, M. Enyo, T.Mizuno, T.Nodasaka, and H.Mina gawa, *Fusion Technol.*, 31, 210 (1997).
3. T. Ohmori, T. Mizuno, Y. Nodasaka. M. Enyo, *Fusion Technol.*, 33, (1998) to be published.
4. T. Ohmori and T. Mizuno, "Current Topics in Electrochem istry," Eds. J.O'M. Bockris, E.I. Cairns, M. Froment, Z. Galus, Y. Ito, S.Trasatti and T.J. VanderNoot, (1998) *Research Trends*, Trivandrum, pp. 37.
5. H. Yamada, M. Ishida, Y. Umezu and H. Hirahara, *Proceedings of 1997 Symposium on Nuclear Transmutation in Solid State* (The Society of Materials Engineering for Resources of Japan), p. 93 (1997).
6. G.H. Miley and J.A. Patterson, *J. New Energy*, Vol.1, No. 3, (1996).
7. G.H. Miley, G.Name, M.J. Williams, J.A.Patterson,J. Nix, D. Cravens and H. Hora, *Proceedings of ICCF-6*, Hokkaido, Japan, p.629 (1996).
8. T. Mizuno, T. Ohmori and M. Enyo, *Proceedings ICCF-7*, 1998.
9. T. Mizuno, T. Ohmori and M. Enyo, *J. New Energy*, Vol. 1, No. 9, 37 (1996).
10. T. Mizuno, T. Ohmori and M. Enyo, *J. New Energy*, Vol. 1, No. 3, 31 (1996).
11. Y. Iwamura, T. Itoh, N. Gotoh and Toyoda, *Proc. ICCF-6*, Hokkaido, Japan p. 274 (1966).
12. F. Cellucci, P.L. Cignini, G. Gigli, D. Gozzi, M. Tomellini, E. Cisbani, S. Frullani, F. Garibaldi. M. Jodice and M. Urciuoli, *Proc. ICCF-6*, Hokkaido, Japan p. 3 (1966).

Fox continued from page 13

some experimenters use an alternating or pulsating current so that the oxide layer is reformed during the positive portion of the alternating current. The author proposes that a vapor film between the electrolyte and the electrode can also provide a similar and sufficient insulating layer for the local production of high-density charge clusters by field emission. The observed pulsing effect caused by intermittent contact of portions of the electrode and electrolyte in the "Ohmori Effect" is an excellent method for producing short pulses of electric current—suitable for the field emission of charge clusters. According to Shoulders *et al.*[10], it is also necessary for the charge cluster to produce and carry positive ions (such as protons from the water in the electrolyte) to cause the nuclear reactions.

Charge clusters are best formed in low-pressure gas environments by very short pulses of voltage onto a specially-prepared cathode. Charge clusters also are formed by the fracturing of crystals including metals) by a process named fracto-emission (a source of high-voltage, short electric pulses)[10]. This formation of charge clusters has been proposed as the source of the intermittent production of excess heat in cold fusion experiments. The intense electric fields and magnetic fields that are locally produced by charge clusters have caused some scientists to label these clusters as "Nature's micro-mini-Tokamaks." Considerable evidence for charge-cluster nuclear reactions, in addition to the excellent paper by Ohmori[5], has been reported[6-10]. Under suitable conditions, both fission and fusion events and even multiple-body nuclear reactions appear to be possible (and necessary to explain observed nuclear products).

A final comment: The dissolution of a charge cluster is an abrupt explosive-type reaction involving billions of electrons and produces a sharp electromagnetic pulse which can easily be picked up on a transistor radio tuned off-station on the AM band. It is likely that this type of EMP will affect instrumentation connected to or near the experiment.

REFERENCES

1. Herbert H. Kellogg (School of Mines, Columbia University, New York), "Anode Effect in Aqueous Electrolysis," *J. Elec trochemical Society*, April 1950, pp 133-142, 12 figs, 11 refs.
2. G. Oesterheld and E. Brunner, *Z Electrochem.*, 22, 38 (1916).
3. K. Amdt and H. Probst, *Z. EIectrochem.*, 29, 323 (1923).
4. H. Wartenberg, E. Manthey, and W. Conzelmann, *Z. EIectrochem.*, 32, 330 (1926).
5. T. Ohmori and T. Mizuno, "Strong Excess Energy Evolution, New Element Production, and Electromagnetic Wave and/or Neutron Emission in the Light Water Electrolysis with a Tungsten Cathode," Presented at ICCF-7, Vancouver, May1998.
6. Atul Bhadkamkar and Hal Fox, "Electron Charge Cluster Sparking in Aqueous Solutions," *J. of New Energy*, Vol 1, No. 4, Winter 1996, pp. 62-68, 2 figs., 28 refs.
7. Shang-Xian Jin & Hal Fox, "Characteristics of High-Density Charge Clusters: A Theoretical Model," *J. of New Energy*, Vol. 1, No 4, Winter 1996, pp 5-20, 16 refs, 2 figs.
8. Hal Fox, Robert W. Bass, & Shang-Xian Jin, "PIasma-lnjected Transmutation," *J. of New Energy*, Vol. 1, No. 3, Fall 1996, pp. 222-230, 23 refs., 4 figs.
9. Hal Fox and Shang Xian Jin, "Low-energy Nuclear Reactions and High-density Charge Clusters," presented at the annual meeting of the American Nuclear Society, Nashville, Tennessee, June 9, 1998, 16 refs., 9 figs, 3 tables.
10. Ken Shoulders and Steve Shoulders, "Observations on the Role of Charge Clusters in Nuclear Cluster Reactions," *J. of New Energy*, Vol. 1, No. 3, pp 111-121, Fall 1996, 7 refs., 22figs.

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American Nuclear Society Annual Meeting Features Cold Fusion / Low Energy Transmutation Sessions—*Again*

Summary and Review by Eugene Mallove

It seems that cold fusion may finally have "arrived"— sessions on cold fusion and low-energy transmutation have now become a permanent feature of American Nuclear Society annual meetings. The latest sessions, lasting a day and a half, occurred June 9th and 10th, at the 1998 meeting in Nashville, Tennessee at the famed Opryland Hotel Convention Center complex. The ANS's annual meeting this year was combined with its "13th Topical Meeting 'Technology of Fusion Energy'"—*hot* fusion! Last year, a shorter low-energy nuclear reaction session occurred at the ANS annual meeting in Orlando, Florida (see *Infinite Energy*, issue 13/14 p. 15).

The formal names of the sessions were: "Isotopes and Radiation: Transmutation and Isotope Production by Low-Energy Nuclear Reactions in Solids I & II (June 9), and Workshop (June 10)." The session organizer was Prof. George H. Miley of the University of Illinois, editor of *Fusion Technology*, one of the leading publications of the ANS that since September 1989 has contained *both* hot and cold fusion peer-reviewed technical articles.

The workshop, "Transmutation and Isotope Production by Low-Energy Nuclear Reactions in Solids," following the formal sessions was intended to provide interested ANS meeting attendees with an overview of the field of low-energy nuclear reactions. The panel of several key researchers in the field provided a brief presentation. Issues addressed were the present status of the research, status of current theory, proposed new experiments, scale-up issues, and possible future applications, including heat production and radiation amelioration. Questions and comments were welcomed from attendees. Panelists were: Dr. John Fisher (Fisher Consulting), Prof. R. A. Oriani (Univ. of Minnesota), Dr. Michael McKubre (SRI International), Prof. Yeong Kim (Purdue Univ.), Dr. Talbot Chubb (Oakton International), Prof. Heinrich Hora (Univ. of New South Wales, Australia), Prof. Lali Chatterjee (Cumberland Univ.), and Maria Okuniewski (CETI, Sarasota, Florida).

The formal paper sessions were delivered on an "invited" basis. Following are the titles and affiliations, to show the scope of the material presented:

1. "Materials and Electrochemical Conditions Affecting Hydrogen Absorption in Metal Cathodes," Michael C. H. McKubre, Steven Crouch-Baker, Francis L. Tanzella (SRI Int.)

2. "Characteristics of Potential Low-Energy Nuclear Reactions in Solids," George H. Miley (Univ. of Illinois).

3. "Amelioration of ^{235}U, ^{234m}Pa, ^{212}Pb and ^{228}Ac Within an Electrolytic System," Maria A. Okuniewski, James A. Patterson, Gabriel B. Collins (CETI, Sarasota), George H. Miley (Univ. of Illinois).

4. "Improved Reactor Performance Using π-Notch Operation and Gold Anodes," Mitchell R. Swartz (JET ETI).

6. "Low-Energy Nuclear Reactions from Charge Clusters," Hal Fox, Shang Xian Jin (Trenergy).

7. "Open Problems and Uncertainties in the Conventional Nuclear Fusion Theory at Low Energies," Yeong E. Kim, Alexander L. Zubarev (Purdue Univ.).

7. "Cold Fusion Phenomena Understood as Polyneutron Chain Reactions," John C. Fisher (Fisher Consulting).

8. "Testing the Polyneutron Theory of Low Energy Nuclear Reactions," R. A. Oriani (Univ. of Minnesota).

9. "Argument for Pressure-Controlled Deuterium-Induced Nuclear Fusion Tests," Talbot A. Chubb, Scott R. Chubb (Oakton International).

10. "Nuclear Excitation by Acoustic Resonance," Yan Kucherov (ENECO)

11. "Aneutronic, Radiationless Nuclear Fusion in Metal Deuterides at Absolute Zero," Scott R. Chubb, Talbot A. Chubb (Oakton International)

12. "Nuclear Shell Magic Numbers Fitting Low-Energy Nuclear Reaction Experiments," Heinrich Hora, Jak C. Kelly (Univ of New South Wales-Australia), George H. Miley (Univ. of Illinois).

13. "Nucleo-Weak Model for Isotope Production in Low-Energy Nuclear Reactions," Lali Chatterjee (Cumberland Univ.).

Abstracts and Summaries of the Papers:

Electrochemist **Mike McKubre** of SRI International, led off by discussing electrochemical insertion of hydrogen or deuterium into the lattice of metal cathodes. His meeting abstract gave this overview: "Although far from being established by reproducible control or determined mechanism, the observations that support these claims are sufficiently robust and widespread to justify the following inquires:

"1. What (if any) mechanism of low-energy, lattice-induced energy transfer might give rise to the anomalous nuclear products and processes?

"2. What experimentally accessible parameters must be controlled to maximize and establish reproducible control over any anomalous effect?

"3. What is the role of electrochemistry and hydrogen (isotope) absorption in the process and in the reproducible attainment of critical precondition?

Cold fusion theorist Prof. Y. E. Kim of Purdue University (L) enjoys a luncheon interlude with Dr. Mitchell R. Swartz of JET Energy Technology, Inc. after the morning session, June 9th. *(Photo: EFM)*

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"4. What are the normal and expected consequences of prolonged electrolysis under the conditions used to engender the anomalous effects?"

An important concluding section of the abstract:

"Using palladium/deuterium as a reference system, numerous experiments have been performed to examine the effects of chemical purity, electrochemical conditions, surface effects, and materials properties on the ability of a metal cathode to absorb and retain hydrogen and its isotopes at very high chemical potentials. On the basis of these experiments, the issues of electrolyte chemical purity and the identification of critical impurities as well as appropriate cathode surface pretreatments have been partially resolved. Conditions in the environment external to a cathode (temperature, electrode geometry, electrolyte composition, surface pretreatment) clearly affect the ability of palladium to absorb deuterium. These factors are, however, relatively easily controlled, although the effects of electrolytic impurity species at sub-parts-per-million levels remain to be fully understood and effectively controlled. Of far greater concern is the variability of bulk phase materials properties between palladium samples, which, in nominally identical experiments, results in an apparent irreproducibility in the ability of palladium cathodes to absorb and retain deuterium. From studies of the relationship between metal resistivity and cathode current density, we conclude that an important characteristic that affects the ability of palladium (and other metals and alloys) to absorb and retain hydrogen (or deuterium) at high levels of chemical potential is the mechanical disruption of the lattice and subsequent venting precipitated by the nucleation of high-pressure gas in preexistent voids within the metal lattice structure."

Dr. Scott R. Chubb (L) of the US Naval Research Laboratory, and his uncle, Dr. Talbot A. Chubb of Oakton International (formerly of the US Naval Research Laboratory), collaborating cold fusion theorists who attended the ANS meeting. *(Photo: EFM)*

Hal Fox of Trenergy, Inc. of Salt Lake City (L), discussed "Low Energy Nuclear Reactions from Charge Clusters." At a post-session gathering with chemist John Thompson (R) of Nassau, Bahamas, and his Florida-based associate (C), after viewing a video tape of Thompson's Ohmori/Mizuno experiment duplication. *(Photo: EFM)*

Dr. George H. Miley of the University of Illinois reviewed studies of "possible" low-energy nuclear reactions (LENRs) at the University of Illinois. These have involved thin films (500 to 1000 Å) of metals such as Ni, Pd, Ti, Ag on millimeter-diameter plastic beads (Patterson Cell beads).

From the abstract: "These coated beads serve as the cathode in a flowing packed bed electrolytic cell with 1.0 M $LiSO_4$ in H_2O as the electrolyte.[1-3] Following 3- to 4-week runs with 2 to 3 V, 1 to 5 mA applied at bed temperatures of ~70°F, the metal films have been analyzed using neutron activation analysis, secondary ion mass spectrometry, inductively coupled argon plasma mass spectrometry, and scanning electron microscopy techniques. Large numbers of 'new' isotopes, ranging from low mass number *A* to *A* values well above that for the film metal, are found. Great care has been taken to rule out possible impurity effects, so the new isotopes are thought to be LENR products. If so, the corresponding LENR theory must accommodate the following key characteristics observed in the experiments:

"1. Reaction products (some 70 to 80 isotopes) predominately lie in four mass bands, A = 30 to 40, 50 to 80, 110 to 130, and 190 to 210.

"2. Significant isotope shifts from natural abundance occur in ~40% of the 70 to 80 isotopes observed but with an apparent statistical variation for different metals.

"3. Hard radiation emission (gamma neutrons) is very low, near background. Evidence for low-energy (~20 keV) X-ray or beta emission exists.

"4. Production rates as high as ~$10^{16}/cm^3 \cdot s$ occur for some key elements.

"5. Relative isotope yields within the four mass bands depend on the film metal.

"A small excess heat (order of 0.5 W/cm^3) was measured in many of the single film experiments. This is roughly in agreement with an energy balance calculation of the binding energy yield product of the various elements produced less the binding energy-consumption product of the reactants (base metal plus protons).

"One possible reaction model to explain those various observations is termed RIFEX[1]. In it, *e-p* capture reactions in high electron density regions at film interfaces with large Fermi energy level differences initiate reactions leading to the formation of heavy 'compound' nuclei containing multiple base metal nuclei and lying at *A* ~ 40, 76, 120, 194, and 310. Based on postulated *n-p* pairing, these nuclei are slightly unstable and ultimately fission, producing the four-mass-region pattern. The low excitation energies favor stable and near-stable product isotopes with little emission of hard radiation."

1. G.H. Miley, "Possible Evidence of Anomalous Energy Effects in H/D-Loaded Solids—Low Energy Nuclear Reactions (LENRs)," *Proc. Breakthrough Propulsion Physics Workshop*, NASA Lewis Research Center, Cleveland, Ohio (1997).

2. G.H. Miley *et al.* "Quantitative Observation of Transmutation Products Occurring in Thin-Film Coated Microspheres During Electrolysis," Progress in New Hydrogen Energy, Vol. 2, p. 629, M. Okamoto, Ed. (1997)

3. G.H. Miley and J.A. Patterson, "Nuclear Transmutations in Thin-Film Nickel Coatings Undergoing Electrolysis," *J. New Energy*, **1**, 1 (1996).

Chemist **Maria Okuniewski** of CETI, delivered a paper: "Amelioration of ^{235}U, ^{234m}Pa, ^{212}Pb and ^{228}Ac Within an Electrolytic System," work done jointly with **James A. Patterson and**

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TABLE I

Gamma-Ray Spectrometer Results Obtained for Run 1 (U- and Th-Loaded Particles)

Run 1 Control	Date of Count	^{235}U-185 keV nCi/sample	^{234m}Pa-1001 keV nCi/sample	^{208}Tl-2614 keV nCi/sample	^{212}Pb-238.6 keV nCi/sample	^{228}Ac-911.2 keV nCi/sample
Initial Particles[a]	09/18/97	0.5708 ± 0.0031	55.92 ± 0.38	1.522 ± 0.016	1.496 ± 0.005	2.388 ± 0.013
Li_2SO_4 (aq)[b]	09/24/97	0.2022 ± 0.0026	0.348 ± 0.160	Not Measured	0.0806 ± 0.0024	0.4773 ± 0.0105
Processed Particles[c]	09/25/97	0.3536 ± 0.0033	53.35 ± 0.55	0.354 ± 0.003	1.218 ± 0.006	1.972 ± 0.016
Rc = [Li_2SO_4 (aq)+Processed Particles] / [Initial Particles]		0.974	0.960	N/A	0.868	1.026
Run 1 Reacted	**Date of Count**	**^{235}U-185 keV nCi/sample**	**^{234m}Pa-1001 keV nCi/sample**	**^{208}Tl-2614 keV nCi/sample**	**^{212}Pb-238.6 keV nCi/sample**	**^{228}Ac-911.2 keV nCi/sample**
Initial Particles	08/03/97	0.6490 ± 0.0028	63.37 ± 0.37	1.769 ± 0.015	1.746 ± 0.004	2.556 ± 0.001
Li_2SO_4 (aq)	09/20/97	0.2486 ± 0.0031	9.747 ± 0.284	0.2868 ± 0.0095	0.2877± 0.0034	0.9792 ± 0.0130
Processed Particles	09/22/97	0.3220 ± 0.0020	42.22 ± 0.33	0.957 ± 0.012	0.984 ± 0.003	1.217 ± 0.009
Rr = [Li_2SO_4 (aq)+Processed Particles] / [Initial Particles]		0.879	0.820	0.703	0.728	0.869
Change % = (Rr - Rc)x100		-9.5%	-14.0%	N/A	-14.0%	-16.6%

[a]Particles before loading into cell or processed as control.
[b]Li_2SO_4 eluted and separated from particles.
[c]Reacted or control processed particles isolated from Li_2SO_4.

TABLE II

Gamma-Ray Spectrometer Results Obtained for Run 2 (U-Loaded Particles)

Run 2 Control A	Date of Count	^{235}U-185 keV nCi/sample	^{234m}Pa-1001 keV nCi/sample
Initial Particles	08/03/97	1.687 ± 0.004	92.48 ± 0.45
Li_2SO_4 (aq)	09/22/97	0.9984 ± 0.0006	27.47 ± 0.48
Processed Particles	09/23/97	0.5252 ± 0.0030	21.36 ± 0.32
Rca = [Li_2SO_4 (aq)+Processed Particles] / [Initial Particles]		0.903	0.528
Run 2 Control B	**Date of Count**	**^{235}U-185 keV nCi/sample**	**^{234m}Pa-1001 keV nCi/sample**
Initial Particles	09/19/97	1.662 ± 0.003	57.43 ± 0.26
Li_2SO_4 (aq)	09/26/97	1.034 ± 0.006	4.607 ± 0.300
Processed Particles	09/26/97	0.6613 ± 0.0013	45.29 ± 0.18
Rcb = [Li_2SO_4 (aq)+Processed Particles] / [Initial Particles]		1.020	0.869
Run 2 Reacted	**Date of Count**	**^{235}U-185 keV nCi/sample**	**^{234m}Pa-1001 keV nCi/sample**
Initial Particles	08/04/97	2.4600± 0.0042	135.20 ± 0.51
Li_2SO_4 (aq)	09/22/97	1.306 ± 0.006	24.08 ± 0.45
Processed Particles	09/23/97	1.030 ± 0.004	50.56 ± 0.45
Rr = [Li_2SO_4 (aq)+Processed Particles] / [Initial Particles]		0.950	0.552
Change % = (Rr - Rca)x100		4.6%	2.4%
Change % = (Rr - Rcb)x100		-7.0%	-31.7%

Gabriel B. Collins of CETI and, George H. Miley (Univ. of Illinois). This experimental work is of such central importance, that we reproduce the abstract in full:

"An evaluation of radioactive amelioration technology within an electrolytic cell, developed by Patterson,[1] was conducted. The cell utilized a packed bed consisting of a carbon matrix loaded with uranium and ^{232}Th. Two runs were performed utilizing different carbon particles. The first run employed carbon particles that were loaded with uranium and ^{232}Th. The second run consisted of carbon particles loaded with only uranium. The electrolyte, 1 *M* Li_2SO_4, was circulated within the system. The operating system consisted of the Patterson Transmutation Cell, electrolyte reservoir, gas filter, gas meter and trap (optional), pump, stroke rate controller, flowmeter (optional), direct-current power supply, and data acquisition system. The cells were reacted for ~ 16 h during each run. In situ analyses were conducted employing a portable high-purity germanium (HPGe) gamma-ray spectrometer and neutron detector. Before undergoing electrolysis, the particles were subjected to a stationary gamma-ray spectrometer (HPGe) analysis. The ^{235}U isotope was measured by the 185-keV gamma ray. The 1001-keV gamma ray of ^{234m}Pa was utilized to characterize ^{238}U. Thorium-232 was quantified with the 238.6-, 911.2-, and 2614-keV gamma rays of ^{212}Pb, ^{228}Ac, and ^{208}Tl, respectively.

"Subsequent to the reaction, the particles and electrolyte were processed as follows. The electrolyte and carbon particles were removed from the test apparatus, combined, and dried. The dried electrolyte was eluted and physically separated from the particles. The separated particles were dried. All of the intermediate prepared samples previously mentioned underwent gamma-ray spectrometry.

"Control samples were created to identify possible losses and other anomalous effects that may have occurred due to sample handling and processing. These samples were chemically processed in the identical manner as the reacted samples. They were not exposed to the components of the experimental apparatus.

"Gamma-ray results from runs 1 and 2 are shown in Tables I and II, respectively. The values of run 1 control and reacted, processed particles added to the Li_2SO_4 (aq) when compared to the initial particles, decreased in the activity of ^{235}U, ^{234m}Pa, ^{212}Pb, and ^{228}Ac ranging from 9.5 to 16.6%.

"Run 2 reacted, when compared to run 2 control A (Table II) exhibited an increase of ^{235}U and ^{234m}Pa of 4.6 and 2.4%, respectively, within the initial particle activity versus the total activity of the Li_2SO_4 (aq) and processed particles. However, run 2 results employed an additional control (run 2 control B) that indicated a reduced activity of ^{235}U and ^{234m}Pa of 7.0 and 31.7%, respectively. Due to the variability of the control samples, further investigation must be performed with respect to sample stability. Run 2 results are unclear, which demonstrates the need to further enhance the amelioration process and optimize cell operation parameters.

"Although isotope amelioration was apparently demonstrated within the reactions, these results confirm the need for additional research of this electrolytic cell. An explanation must be found for the occurrence of the decreasing and increasing levels of ^{235}U ^{234m}Pa ^{212}Ph and ^{228}Ac throughout the duration of the reaction and the control preparation. Other investigations are pending to resolve isotopic differences through inductively coupled plasma mass spectroscopy. Results of elemental transmutation will be compared to previous work performed by Miley *et al.*[2] Future experiments will focus on improved elemental sample uniformity."

1. J.A. PATTERSON, "System with Electrolytic Cell and Method for Producing Heat and Reducing Radioactivity of a Radioactive Material by Electrolysis," U.S. Patent 5,672,259 (Sep. 30, 1997).
2. G.H. MILKY, G. NARNE, M. J. WILLIAMS, J. PATTERSON, J. NIX, D. CRAVENS, H. HORA, *Proc. 6th Int. Conf. on Cold Fusion*, Hokkaido, Japan, October 14-17, 1996.

Dr. Mitchell R. Swartz of JET Energy Technology, Inc. delivered his paper, "Improved Reactor Performance Using π-Notch Operation and Gold Anodes." Again, due to the importance of this paper, the ANS abstract is reproduced in full:

"In low-energy nuclear reactors, nickel light-water systems (anodes of nickel or platinum) that were examined using low-noise multi-ring calorimetry demonstrate biphasic responses in excess heat production as a function of input electrical power. This excess heat is not observed for ohmic controls or with iron, aluminum, or platinum as cathodes. The excess heat also persists when integrated energy, electrical noise, radiant heat, and chemical factors are considered.[1] We now report confirmation

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of the biphasic behavior of the generated excess heat with anodes of nickel, gold, and graphite in nickel systems. Furthermore, other work in palladium heavy-water low-energy nuclear systems, with their more demonstrable nuclear ash,[2,3] suggests that both excess heat and nuclear ash production may also have biphasic responses.

"Analysis of system behavior, including that for the electrical input power yielding a peak excess heat production (π-notch) has revealed that the site of maximum heat production changes at different points around the π-notch. At the lowest power levels, the observed heat (below unity power gain) comes from both anode and cathode. Driving the electrodes near the π-notch, however, produces a cathode that is hotter than the anode. It was observed that electrical inputs beyond the π-notch produce an anode that becomes relatively hotter than the cathode. Given the increased levels of gas formation, this may be consistent with recombination to form water.

"There are several important impacts of this biphasic behavior. First, failure to achieve π-notch operation may account for some of the widespread difficulties in observing the phenomena. Second, the biphasic power gain implies an optimum operating input power level. Beyond the π-notch, the peak power ratio in several low-energy nuclear systems falls off despite increasing input power until it is below 1.

"Third, the use of π-notch operation enables comparison of additives, including improvements to increase power gain. For example, by characterizing samples at their peak power output, we have been able to further investigate the roles of various group VIII metals and other materials as anodes. When optimally driven within the π-notch region, nickel spiral wire cathodes (light water, platinum foil anodes) exhibit peak power amplification in the range of 1.3 to 3 (peak power outputs in excess of 2 W, power densities ~7 W/cm^3). We now report significant improvement observed with substitution of gold for platinum at the anode in low-energy nuclear reactors. Gold anodes result in significantly larger power amplification (range ~2 to 9). Like platinum, gold anodes may deteriorate through anodic decomposition and cation transport in the applied electric field to generate a *de novo* slowly deposited superficial cathodic barrier. It is hypothesized that the gold barrier interferes with hydrogen isotope movements.

"The etiology of the biphasic behavior may be explained by quasi-one-dimensional investigations into loading,[4] which incorporate electrophoretic mobilities and diffusivities rather than assume electrochemical equilibrium. Such kinetic analysis indicates that loading (hydrogen isotope/metal nuclei) and the loading rate ratio (the first-order rate of hydrogen isotope entry to the metal / the rate to gas electrolysis) play important roles at opposite sides of the π-notch. There may also be a rate-limiting reaction pathway."

1. M. SWARTZ, "Consistency of the Biphasic Nature of Excess Enthalpy in Solid State Anomalous Phenomena with the Quasi One-Dimensional Model of Isotope Loading into a Material," *Fusion Technol.*, **31**, 63 (1997).
2. M. H. MILES, B. F. BUSH, "Heat and Helium Measurements in Deuterated Palladium," *Trans. Fusion Technol.*, **26**, 156 (1994).
3. F. G. WILL, K. CEDZYNSKA, D. C. LINTON, "Tritium Generation in Palladium Cathodes with High Deuterium Loading," *Trans. Fusion Technol.*, 26, 209 (1994).
4. M. SWARTZ, "Quasi-One-Dimensional Model of Electrochemical Loading of Isotopic Fuel into a Metal," *Fusion Technol.*, **22**, 2, 296 (1992).

Martin Gruber of CETI discussed a new environmental remediation technology—*not* a new energy or transmutation technology—that the company is pioneering. This is a new method for separating isotopically differing forms of water. He delivered a paper co-authored with **Dr. Patterson**: "Separation of H_2O, D_2O, and T_2O Using a Novel Membrane Separation Technique." In full, the abstract:

"The study presented offers a possible method for the separation of different hydrogen isotopes in water. The method is based on the differentials in diffusion rates through a cellulose acetate membrane. A detailed study of diffusion rates of H_2O and D_2O has led to a prediction of the diffusion rate of T_2O through the membrane. This selective property of the membrane allows for the application of removal and concentration of tritiated water, which appears as a waste stream in nuclear reactors.

"An initial study was carried out to investigate the properties of the membrane and the differentials of diffusion rates for H_2O and D_2O. The first data obtained showed a differential in diffusion rates of 20 to 40% favoring the diffusion of H_2O. To increase this differential and to control the separation, parameter studies were performed for the diffusion rates of pure H_2O and pure D_2O. The variables studied were surface area, temperature, humidity, pressure, pH, and ionic activity. Special chemical treatments of the membrane surface were examined. Subsequently, data were collected on the separation of a mixture of H_2O and D_2O. The concentrations of H_2O and D_2O in the mixture were monitored by freezing-point determination. The results of these studies allowed for a prediction of the diffusion rate of T_2O (and HTO) through the membrane. The predicted diffusion rate of tritium oxide is ~30 to 50% lower than the diffusion rate of H_2O. Using this separation capability, experiments were performed to remove HTO from tritiated water. Since the diffusion rate of T_2O (and HTO, HOD) is significantly lower than the diffusion rates of the other isotopes, the concentration of tritium oxide in the membrane is increasing to a given equilibrium.

"This offers an application to treat the tritiated water waste stream of nuclear power plants. By concentrating the tritium oxide on one side of the membrane and eventually using cascading techniques, the volume of water that has to be stored can be drastically reduced.

"Following the earlier work performed on transmutations,[1] the concentrated tritium oxide could be used in a transmutation cell configuration to enhance the low-energy nuclear reactions and to finally eliminate the tritium."

1. G. H. MILKY, G. NARNE, M. I WILLIAMS, J. PATTERSON, J. NIX, D. CRAVENS, H. HORA, *Proc. ICCF 6, Hokkaido*, Japan, October 14-17, 1996.

Hal Fox of Trenergy, Inc. in Salt Lake City, has been concentrating on the application of Ken Shoulder's charge clusters to nuclear reactions. He delivered a paper written jointly with Shang Xian Jin, "Low-Energy Nuclear Reactions from Charge Clusters." [Editor's Note: Hal Fox further elaborates charge cluster technology in connection with this issue's cover story on the Ohmori/Mizuno experiment, pages 13 - 17, *EFM*]. The abstract in full:

"High-density charge clusters, typically with 100 billion electrons, plus attached positive ions (about one positive ion for one million electrons), can be produced in low-pressure gases at atmospheric pressure and (using special electrodes) in aqueous solutions. Experiments have been conducted using radioactive thorium nitrate as an electrolyte in a small reactor operating with <500 V and at temperatures up to 500°F and pressures up to 50 atm. The experimental hypothesis is that high-density charge clusters can be used to produce nuclear reactions in a relatively low-energy environment.

"The experimental protocols developed by Gleeson of the Cincinnati Group were used.[1] A cylindrical zirconium electrode together with an axis-centered zirconium disk electrode was arranged so that the cylindrical electrode with Teflon end caps

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became a small pressure vessel. The two electrodes are connected to a variable alternating-current power supply for a period of 30 min.

"In the course of a few dozen experiments, similar but not identical results were obtained. More than 95% of the thorium was removed from the electrolyte in 30 min of processing. The disk electrode (removed immediately after the 30-min processing) showed an increase in radioactive emissions that peaked in 2 to 10 hours. Emissions were measured variously by a Geiger-Muller tube, a portable alpha detector, and by using a 2-inch-long x 2-inch-diameter sodium iodide crystal gamma-ray detector* connected to an Aptec multichannel analyzer installed in an IBM-compatible personal computer. The radioactivity of the disk electrode decreases exponentially, reaching half of the peak level in 50 to 100 hours. The surfaces of both the disk electrode and the inner surface of the cylindrical electrode are pitted and cratered from the action of the high-density charge clusters. The pitting cratering is explained by small explosive-like nuclear reactions produced by the high-density charge clusters. Charge clusters are believed formed by field emission of electrons from the metal metal-oxide layer of the zirconium electrodes.

"The production and control of high-density charge clusters carrying positive ions are expected to be developed into a system for the amelioration of high-level radioactive wastes. That such high-density charge clusters can be produced is an experimental fact.[2] The stability of such charge clusters has been analytically treated and shown to be toroidal in form and to produce extremely high levels of local electric and magnetic fields.[3] Due to the high electron-to-positive-ion ratio, a combined charge cluster can be accelerated to high-impact energies using relatively low potentials. A 5000-V potential can provide charge cluster velocities of about one-tenth the speed of light. It is classical physics that positive ions (such as protons) can produce nuclear reactions at such velocities. A proton particle accelerator would require ~9 million V to produce one-tenth light-speed velocities. Therefore, tabletop particle accelerators can now be designed and used to produce nuclear reactions.

"Further experimental work will be conducted using a germanium sensor in the gamma-ray spectroscope. This work is designed to track the type of nuclear reactions that are being produced. It is hypothesized that protons are injected into the nuclei of heavy elements (such as thorium) and produce a nuclear instability resulting in fissioning of the heavy nuclei into smaller fragments. Due to the lack of neutrons produced from this type of reactor, it is further hypothesized that the nuclear fragments are neutron rich and decay by beta emission (where excess neutrons become protons). It is believed that a part of the observed radioactive decay of the disk electrode is explained by the beta emission processes, where neutron-rich isotopes decay to stable elements over a period of a few hours to a few days.

"Careful measurements of the gamma-emission radioactivity of the entire reactor show an initial small increase in radioactivity after processing with a gradual decay to slightly less than the initial radioactivity. Due to the weak gamma-ray emission from the thorium, the thick walls of the reactor, and the background radiation (from bremsstrahlung and Compton scattering of the ubiquitous high-energy gamma-ray photons), most of the preprocessing observed gamma rays are from the small amounts of thorium daughter products. If the minute amounts of daughter products do not participate in the nuclear reactions, there will be little change in the after-processing gamma-ray measurements. Therefore, this procedure is not recommended as a valuable measure of the transmutation of the thorium. Accurate and detailed microchemical measurements are required."

1. CINCINNATI GROUP, "Protocol for Thorium Activity Remediation," *Infinite Energy*, 3, 13 & 14, 17 (1997).
2. K. SHOULDERS, S. SHOULDERS, "Observation on the Role of Charge Clusters in Nuclear Cluster Reactions," *J. New Energy*, 1, 3 (Fall 1996).
3. S.-X. JIN, H. FOX, "Characteristics of High-Density Charge Clusters: A Theoretical Model," *J. New Energy*, 1, 4, 5 (Winter 1996).

*Ludlum Measurements, Model 44-10D.

After the previous largely experimentally-based papers came a group of theoretical papers. **Prof. Yeong E. Kim** of Purdue University delivered a paper done jointly with **Alexander L. Zubarev** of Purdue: "Open Problems and Uncertainties in the Conventional Nuclear Fusion Theory at Low Energies." A reduced form of their abstract, giving the essential conclusion:

"Theoretical opposition to the phenomena of CF and ULENT is mostly based on astronomically small values of the Coulomb barrier penetration probability, Gamow factor (GF), between two charged nuclei. The effect of the presence of a third particle, an electron, has not been solved rigorously but has been treated in an effective two-body approximation as a simple correction to GF known as the electron screening effect. The electron screening effect is not large enough to explain the observed claims of CF and ULENT (ultra low energy nuclear transmutation) phenomena... Recently, we developed a new improved formulation based on the optical theorem that eliminates some of the previous assumptions made in deriving the conventional formula of cross section with the GF for low-energy fusion reactions.[2-3] It is shown that some of the anomalous effects observed in deuterated metals may be explained theoretically in terms of a reduction or near cancellation of the GF if the imaginary part of the effective nuclear interaction in the elastic channel has a weak component with a long finite interaction range."

Further theoretical analysis the author's say, "may have important implications for resolving some astrophysical (solar neutrino problem, etc.) and geophysical anomalies and also for providing theoretical support for some of the CF and ULENT phenomena." References cited:

1. V. A. CHECHIN, V. A. TSAREV, M. RABINOWITZ, Y. E. KIM, *Int. J. Theor. Phys.*, 33, 617 (1994).
2. Y. E. KIM, A. L. ZUBAREV, *Nuovo Cimento*, 108A, 1009, (1996).
3. Y. E. KIM, A. L. ZUBAREV, *Phys. Rev. A*, 54, 1805 (1996).
4. Y. E. KIM, A. L. ZUBAREV, *Phys. Rev.* A, 56, 521 (1997).
5. Y. E. KIM, A. L. ZUBAREV, *Proc. 17th Int. Conf: Neutrino Physics and Astrophysics*, p. 120, K. ENQVIST, K. HUITU, I MAALAMPI, Eds., World Scientific, Singapore (1997).

In the afternoon session, **John C. Fisher** of Fisher Consultingelaborated on his "polyneutron chain reaction" concept, which he had earlier discussed at ICCF-7 in Vancouver: "Cold Fusion Phenomena Understood as Polyneutron Chain Reactions." The central themes of his thesis from parts of his abstract:

"Cold nuclear reactions cannot take place at an observable rate without the participation and mediation of a neutral nuclide. The coulomb repulsion between charged nuclides is too great. In fission reactors the mediating nuclides are neutrons that are generated in large numbers in chain reactions based on neutron induced cold fission of uranium. ...If the phenomena are to be considered seriously for membership in the family of accepted nuclear reactions, there must exist other nuclides beyond neutrons to serve as their neutral mediating agents."

"It has been suggested that although neutron pairs are not bound, a larger number of neutrons can be bound into a droplet of nuclear matter, sometimes called a polyneutron, with a density comparable with that of ordinary nuclear matter. It has been further suggested that polyneutrons may be the neutral nuclides responsible for cold fusion reactions, and a liquid drop

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model for the mass excesses of polyneutrons of various sizes has been proposed.[1]..."

"The following picture emerges. Cold fusion reactions are chain reactions of a new kind, in which polyneutrons are the mediating neutral nuclides. These reactions are more complex than those involving neutrons because polyneutrons can grow and shrink in size and can undergo fission. In more detail, polyneutrons with six or more neutrons are bound in the pair-correlated symmetry first described by Bardeen et al.2 for pair-correlated electrons in the superconducting state. They are the neutral members of a previously unrecognized, extremely neutron-rich, second branch of the table of isotopes. Initial polyneutrons are generated by the interaction of neutrons with naturally occurring second-branch nuclides. In interaction with isotopes of Li, Cs, Th, and a few other atomic species, polyneutrons can grow exothermically by accretion of neutron pairs. Growth to a thousand or more neutrons is expected in some reactor configurations. In interaction with isotopes of Ni, Pd, and many other atomic species, polyneutrons can multiply exothermically by fission in the act of shedding neutron pairs. It may be possible to support a chain reaction in an appropriately designed reactor...."

"The evidence suggests that many of the reaction products of cold fusion reactions are members of the new T_{max} branch.

1. J. C. FISHER, "Liquid Drop Model for Extremely Neutron-Rich Nuclei," submitted to *Fusion Technology*.
2. J. BARDEEN, L. N. COOPER, J. R. SCHRIEFFER, "Theory of Superconductivity," *Phys. Rev.*, 108, 1175 (1975).

Prof. Richard A. Oriani of the University of Minnesota, one of the eminent experimentalists in cold fusion, then weighed in with some provocative evidence that may support John Fisher's exotic theory: "Testing the Polyneutron Theory of Low Energy Nuclear Reactions." His abstract, in part:

"This work was designed to test one of the predictions of Fisher's theory of low-energy nuclear reactions..."

"Only chemical techniques can be employed because nothing is known about the electronic transitions of such putative species so that X-ray photoemission spectroscopy, neutron activation analysis, etc., cannot be successfully applied. An oxidation technique has been adopted to try to identify neutron-rich C and N. Metal previously used as cathode in electrolysis was heated in oxygen at 1020 to 1050° C for 10 hours or longer; any gases generated were collected in a side arm dipping into liquid N. The system was then evacuated with the side arm still cold, and then with its stopcock closed, the side arm was removed from the apparatus. An unused piece of the same kind of metal as the cathode was put through the same procedure to serve as a blank. The vial enclosing the gases from the blank was examined at 23° C by a mass spectrometer, and immediately afterward, the gases at 23° C from the cathode were put through the mass spectrometer. It is evident that only species that form and are stable in oxygen at ~ 1030° C and that are volatile at 23° C can produce a significant spectrometric signal. Specifically, any heavy C or N produced by the electrolysis should diffuse at the high temperature to the specimen surface, be oxidized to heavy CO_2 or NO_2, and then convect and diffuse to be condensed in the cold side arm. This technique was first tested and found successful by using low-carbon steel and Ni.

"The described procedure was applied to three Pd cathodes which had generated excess thermal power during electrolysis and to one Ni cathode on which calorimetry was not performed... The averaged mass spectra from the cathodes were carefully compared with those from the corresponding blank; the individual scans were also intercompared."

"Twenty-six peaks were found in the cathode spectra that either had no discernible signal in the corresponding blank or had a signal in the blank barely above noise, whereas the signal from the cathode was much stronger. The literature was searched for compounds having masses within ~0.9 atomic mass unit (AMU) from the values of the 26 peaks, and each of the found compounds was examined for stability at over 1000° C in oxygen and for volatility at room temperature. Applying very conservative judgment, masses 237, 241, and 254 were excluded as perhaps ascribable to C_2Cl_6, $Ru(CO)_5$, and OSO_4, respectively. The remaining 23 peaks found within the examined mass range of 200 to 400 AMU were distributed over 20 subdivisions (bins) of the mass range ... By pure chance the average population of any one bin would be 1.15 peaks. From the Poisson distribution function, it follows that the probability of finding by chance eight or more entries in the mass bin 231-240 is 0.3×10^{-4}. This strongly implies that the masses in that bracket are real, not adventitious."

"The polyneutron theory asserts that neutron-rich C of masses from 187 to 208 is stable against beta decay and fission and therefore may appear as a decay product of low-energy nuclear reactions. Combined with oxygen as CO_2, one would therefore expect masses from 219 to 240. That the well-populated mass bracket 231-240 lies within the predicted range for heavy CO_2 strongly implies that neutron-rich C was produced by these electrolyses. Proof of this inference awaits the development and application of a technique that determines the nuclear charge and mass at the same time."

References cited:

1. J. C. FISHER, *Fusion Technol.*, 22, 511 (1992).
2. J. C. FISHER, submitted to *Fusion Technology*.
3. G. H. MILEY, J. A. PATTERSON, *Proc. 2nd Int. Conf: Low Energy Nuclear Reactions*, Texas A&:M, September 1996, *J. New Energy* (in press).
4. T. MIZUNO, T. OHMORI, M. ENYO, *J. New Energy*, 1, 23 (1996).
5. C. G. WOHL et al.,*Revs. Mod Phys.*,56,2, Part2, 546 (1984).

More theoretical discussion ensued, but of a more "mainstream cold fusion" flavor by eminent cold fusion theorists, **Dr. Talbot A. Chubb, and Dr. Scott R. Chubb**. This uncle and nephew pair, one of whom (nephew Scott) still works at the Naval Research Laboratory on non-cold fusion physics, is required to state affiliation with "Oakton International." The administration within NRL insists that "from now on only 'mainstream research' be conducted at NRL." From our perspective, this seems like an ambiguous policy at best, but we know what it means: "Cold Fusion research is too contentious to be done above-board at NRL" Furthermore, it is not funded there — "so don't work on it." Hey US taxpayers, listen up! This is how Federal research funding goes. Both Chubbs traveled to the ANS meeting at their own expense.

We have in past issues of *Infinite Energy* elaborated on the Chubb theories of cold fusion, so here are just bottom-line conclusions of their 1998 ANS abstract, "Argument for Pressure-Controlled Deuterium-Induced Nuclear Fusion Tests":

"Tests are planned to determine whether exposure of palladium black to high-pressure deuterium gas creates the conditions for cold fusion heat release. The expectation of observable heat is based on experiments by Arata and Zhang [1-3] as viewed in the context of ion band state (IBS) theory.[4,5] The IBS theory attributes the production of heat to small amounts of Bloch-function deuterium in a palladium deuteride lattice. Bloch-function deuterium is matter consisting of a set of D^+ ions spread throughout an ordered crystal and described by a many-body wave function analogous to that used to describe electrons in a metal. Pairs of such deuterons can be described by two-body wave functions..."

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"...The success of Arata and Zhang is believed to be due in part to their use of fine-grain palladium powder.

"Hydrogen atoms typically occupy surface states on metals, where the hydrogen ions sit in potential wells provided by the metal's electron system. Such states are normal chemical states. However, the excited states of surface hydrogen on nickel and copper are nonlocal, two-dimensional Bloch states.[6,7] Three-dimensional Bloch states are believed responsible for cold fusion. The occupation fraction for the excited states grows with increasingly high deuterium chemical potential. The work of Arata and Zhang suggests that the chemical potential achieved by exposing palladium black to 1000-bar D_2 may produce occupation of Bloch states at a high enough DB^{+}_{Bloch} concentration to generate detectable heat power density."

"An autoclave (high-temperature) calorimeter capable of detecting ~ 1 W of heat generation in pressurized palladium black is being constructed."

1. Y. ARATA, Y.-C. ZHANG, "A New Energy Caused by 'Spillover-Deuterium'," *Proc. Jpn. Acad*, **70B**, I (1997).
2. Y. ARATA, Y.-C. ZHANG, "Helium (^{4}He, ^{3}He) Within Deuterated Pd-Black," *Proc. Jpn. Acad*, **73B**, 106 (1994).
3. Y. ARATA, Y.-C. ZHANG, "Solid-State Plasma Fusion ('Cold Fusion')," *J. High Temp. Soc. Jpn.*, **23**, 1 (1997).
4. T. A. CHUBB, S. R. CHUBB, "Cold Fusion as an Interaction Between Ion Band States," *Fusion Technol.*, 20, 93 (1991).
5. T. A. CHUBB, S. R. CHUBB, "Radiationless Cold Fusion: Why Small 'Crystals' are Better, N_{cell}Requirement, and Energy Transfer to Lattice" *Proc. ICCF6*, p. 417 (1996).
6. M. I PUSKA, J. R. M. NIEMINEN, M. MANNINEN, B. CHAKRABORTY, S. HOLLOWAY, J. K. NORSKOV, "Quantum Motion of Chemisorbed Hydrogen on Ni Surfaces," *Phys Rev. Lett.*, 51, 1081 (1983).
7. C. ASTALDI, A. BIANCO, S. MODESTI, E. TOSATTI, "Vibrational Spectra of Atomic H and D on Cu(110): Evidence for H Quantum Delocalization," *Phys. Rev. Lett.*, 68, 90 (1992).

The *second* paper by the **Chubbs** was: "Aneutronic, Radiationless Nuclear Fusion in Metal Deuterides at Absolute Zero." The key points of the abstract:

"We argue that much of the debate concerning 'cold fusion' (CF) has resulted from the misguided assumption that CF somehow must mimic a colder version of conventional fusion. Instead, we suggest that CF is the result of phenomena that are most intense at absolute temperature T = 0 and that these effects persist at room temperature. This alternative approach makes good physical sense because it is unreasonable to believe that particle-particle collisions can provide a mechanism for overcoming the conventional 'Coulomb barrier' at room temperature as many have assumed. Instead, we suggest that the possible avenues to fusion are the result of coherent, many-body effects that are tied to the underlying, well-known rules of solid-state physics as they apply to periodically ordered lattices. In particular, solids are distinctly different from plasmas or high-temperature environments that are usually associated with conventional fusion. Solids, at room temperature, 'do not like' disruption. High-temperature plasmas 'like' disruption...

"Because the idealized limit of stoichiometric PdD is periodically ordered, not only is there reason to believe, as we have discussed previously,[5] that further D-loading will result in the occupation of ion band states by D nuclei, it is probable that the potential nuclear reactions and transport of ion-band-state D will be dominated by these kinds of interactions. When these non-momentum conserving processes involve indistinguishable particles (as in the case of D) and occur completely elastically, distinctly quantum mechanical forms of coherent interaction become possible in which periodic order is preserved, and it can become virtually impossible to identify both the location of the interaction and the participating entities involved with the resulting release of energy.[5-7]...

"These results suggest that optimal geometries consisting of arrays of small crystallites could be used to enhance the magnetic effects, and because D is magnetic, magnetic effects from superconducting behavior could be anisotropic.

Papers cited:

1. D. LINDLEY, "The Embarrassment of Cold Fusion," *Nature*, 344, 376 (1989).
2. N. W. ASHKROFT, N. D. MERMIN, *Solid State Physics*, Chap. 26, Harcourt Brace, Orlando, Florida (1976).
3. N. W. ASHKROFT, N. D. MERMIN, *Solid State Physics*, pp. 364-366 and pp. 470-480, Harcourt Brace, Orlando, Florida (1976).
4. J. SCHWINGER, *Trans Fusion Technol.*, **26**, xvi (1994).
5. T. A. CHUBB, S. R. CHUBB, *Fusion Technol.*, **20**, 93 (1991).
6. S. R. CHUBB, T. A. CHUBB, *Bull APS*, **42**, 1, 678 (1997).
7. S. R. CHUBB, T. A. CHUBB, *Fusion Technol.*, **24**, 403 (1993).
8. S. R. CHUBB, T. A. CHUBB, *Proc. 6th Int. Conf: Cold Fusion*, Tokyo, 1997, pp. 315-318, OKAKAMOTO, Ed.
9. E. WICKE, H. BRODOWSKY, *Hydrogen in Metals* 11, p.73, G. ALEFELD, J. VOLKL, Eds., Springer, Berlin (1978).
10. T. A. CHUBB, S. R. CHUBB, *Proc. 6th Int. Conf: Cold Fusion*, Tokyo, 1997, pp. 417-424, OKAKAMOTO, Ed.
11. T. A. CHUBB, S. R. CHUBB, "Argument for Pressure-Controlled Deuterium-Induced Nuclear Fusion Tests," *Trans. Am.Nuc. Soc.*, **78**, 88 (1998).

Dr. Yan Kucherov, senior scientist with ENECO in Salt Lake City, delivered a theoretical paper, "Nuclear Excitation by Acoustic Resonance." His abstract:

"Nuclear acoustic resonance (NAR) is an established field of nuclear hyperfine levels research.[1] Most of the experimental results are obtained by observing energy coupling in the oscillating magnetic field. Some anomalous effects in terms of NAR line broadening were observed with metal hydrides having stable charge vacancies.[1]

"This paper explores the possibilities of enhancing these anomalies and formulates some of the conditions required to achieve energy transfer to the nucleus along with theoretical and experimental difficulties of this approach.

Solid-State Lattice Conditions

"If a two-component lattice (heavy and light atoms) has non-overlapping phonon spectra of both sublattices, the heavy component sees a sustained phonon mode in a light component as an electric dipole oscillation. Nuclei do not have dipole moments in their ground state, but some of them do have quadrupole moments and thus can interact with these oscillations. Energy cannot be transferred in an ideal lattice because of the symmetry, and lattice symmetry must be broken by creating vacancies in the light sublattice. Optimal vacancy concentration can be calculated for every element combination. To transfer energy by dipole/quadrupole interaction, the heavy component must have orientational stability; *i.e.*, magnetic field sufficient to orient nuclear spin must be applied. Even after all these conditions are met, the energy still cannot be transferred to the nucleus because of the limitations imposed by the generalized form of Anderson's localization theorem,[2,3] which states that the energy lost to the nucleus must be compensated for at least at the same rate from the phonon system. To overcome this limitation, the phonon mode must be strong enough. Semiclassical calculation of the energy transfer rate for specific lattice components gives rates of up to 10^5 eV/s and can exceed all the possible relaxation rates. These rates can be achieved employing the phonon focusing effect and phonon mechanical resonance. The optimum distance between phonon reflecting surfaces can be calculated using phonon amplification/attenuation considerations. For polycrystal FCC metals, this distance is of the order of 1 μm and is technically feasible. There are many ways to create an intensive phonon flux, probably the simplest of them is to form a thermal gradient along the lattice.

"Actual phonon mode intensity can be measured by either neutron scattering or Raman scattering. Both methods are diffi-

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cult to use with a specific device.

"The quantum model for energy transfer in this case is in its embrional state because of the following problems:

"1. Energy storage in the form of a changing quadrupole moment must be combined with the conservation law for a number of quantum levels.

"2. Nuclear hyperfine levels are normally degenerated in terms of spin. The change in quadrupole moment will also affect degeneration, but the specifics are not clear.

"3. Some of the optical analogies such as energy up-conversion in solid-state lasers can be applied, but the extent of this analogy is not clear.

"With all the shortcomings, the excitation predicted by this approach can be tested experimentally by measuring NAR line broadening, or at higher excitation levels by measuring deexcitation products, such as ultraviolet, X rays, etc.

1. D. I. BOLEF, R. K. SUNDFORS, *Nuclear Acoustic Resonance*, Academic Press (1993).

2. R. W. ANDERSON, *Phys. Rev.*, **109**, 1492 (1958).

3. F. AUSEL, *Radiationless Processes*, pp. 250-286, Plenum Press, New York (1979).

Dr. Heinrich Hora of the University of new South Wales in Australia has collaborated with **Jak C. Kelly** and **Prof. George Miley** on theoretical aspects of low-energy nuclear transmutation. He delivered their paper, "Nuclear Shell Magic Numbers Fitting Low-Energy Nuclear Reaction Experiments." Their abstract, in part:

"An analysis is presented for experimental results of fully reproducible measurements of low-energy nuclear reactions of protons in host metals like palladium, nickel, etc., causing nuclear transmutations.[1] We show that the experiments[2] can be related to the magic numbers of the nuclear shell model. The measured generation probabilities *N(Z)* of transmuted elements depending on their atomic number Z, show four exponentially decaying maxima that fit a relation close to 3^n with the exception of the magic number 20.

"Low-energy nuclear reactions with neutrons are standard knowledge, and those with electron are known from K-shell electron capture. The reaction times are between seconds and years, and reaction distances (Bohr radius) are picometres (pm). Using our model[3] of an exotic Maxwellian ion gas of protons or deuterons in the host metals and using a power law[4] for the reaction probability based on hot fusion and myonic fusion, we concluded that the low-energy reactions occur by the Maxwellian fast ions exceeding 1 or 2 eV at a few picometres' distance with reaction times similar to K-shell capture. For achieving the necessary distance of 2 to 3 pm, a screening of the Coulomb potential by a factor of ~ 14 is based on the swimming electron layer at the surface[5] of the host metals or at the interfaces between host metals of different Fermi energy.[3]...

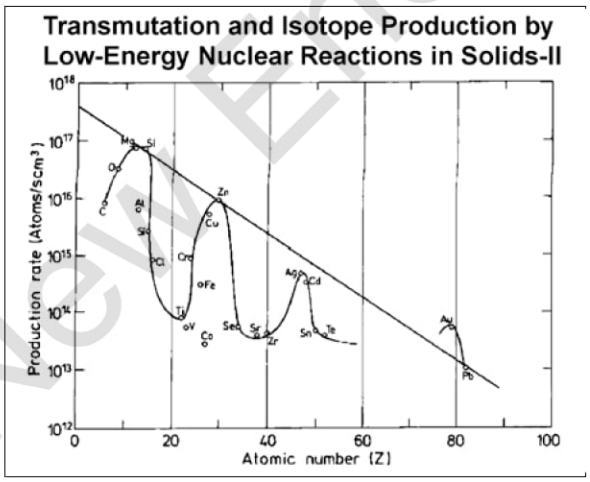

Figure. 1. Measured production rate N(Z) for nuclear transmutation on the atomic number Z for protons in palladium,[1] where an exponential decay of the maxima on Z follows in a relation[2] of Eq.(1).

"The measured transmutation probability *N(Z)* in palladium (Figure 1) was similar in numerous measurements where the four maxima are close to the magic numbers Z = 2, 8,28,50 82, and 126 with the exception of a minimum at the magic number 20...

"This consistency of the relations of the magic numbers with the purely empirical transmutation maxima of Fig. 1 is a remarkable confirmation of the deeper truth behind the measured nuclear transmutations. The exponential basis 3 in Eq. (3), $R(n) = 3^n$, may be a link to the quark multiplicity."

1. G. H. MILKY, G. MARNE, M. J. WILLIAMS, J. A. PATTERSON, J. NIX, C. CRAVENS, H. HORA, *New Hydrogen Energy*, p. 629, M. OKAMOTO, Ed., New Eergy and Industrial Technology, Tokyo (1997).

2. H. HORA, J. A. PATTERSON, Trans. Am. Nucl. Soc, 76, 144 (1997); see also G. H. MILKY, Trans. Am. Nucl. Soc., 76, 155 (1997)

3. H. HORA, G. H. MILKY, M. RAGHEB, A. SCHARMANN, W. SCHEID, *Nuovo Cim.*, 120,393 (1990); see also H. HORA, G. H. MILKY, M. RAGHEB, A. SCHARMANN, *Proc. 8th Cold Fusion*, World Hydrogen Energy Conf., p. 169, Hawaii, July 1990, Hawaii Natural Energy Institute (1990).

4. H. HORA, J. C. KELLY, J. U. PATEL, M. A. PRELAS, G. H. MILEY, J. W. THOMPKINS, *Phys. Lett., A*175, 138 (1993).

5. H. HORA, G. MIN, S. ELIEZER, R LALOUSIS, R. S. PEASE, H. SZICHMAN, *IEEE Trans. Plasma Sci.*, PS-17, 290 (1989.

Concluding the theoretical session was astrophysics **Prof. Lali Chatterjee** of Cumberland University in Tennessee who summarized her "Nucleo-Weak Model for Isotope Production in Low-Energy Nuclear Reactions." The abstract, in part:

"The continued reports of isotope production and nuclear transmutations in low-energy experiments involving electrolysis emphasize the need for a theoretical model able to explain the phenomena. The variety of experimental conditions and observations requires the theory to be comprehensive enough to encompass the different scenarios and yet have a strong enough theoretical base to sustain challenges of viability.

"...The nucleo-weak model proffers a schematic chain whereby a combination of weak interactions and neutron absorption reactions could lead to the observed end products and be compatible with most of the results. The power of the model lies in the use of well-known physical processes as its base, without the need to invoke specially exotic physics.

Cold fusion theorist, Prof. Lali Chatterjee of Cumberland University in Tennessee, an astrophysicist who spoke on the "Electro-Weak Model for Isotope Production in Low-Energy Nuclear Reactions." *(Photo: EFM)*

"The model relies on beta decay and inverse beta-decay-type processes to produce real or virtual neutrons that can thereafter be absorbed by neighboring nuclei. Unstable states of the resulting nuclei could then decay to various end products of their respective chains. Alternately, the initial weak channels could directly yield some of the final isotopes.

ANS continues on page 77

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LOW-ENERGY NUCLEAR REACTIONS AND HIGH-DENSITY CHARGE CLUSTERS

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This paper refers to work that Hal Fox discussed at the ANS Meeting.

Abstract

High-density charge clusters, typically 1 to 20 micron with electron densities of 6.6 x 10^{29} electrons per cubic meter, plus attached positive ions (about one positive ion for one million electrons), can be produced in low-pressure gases, at atmospheric pressure, and (using special electrodes) in aqueous solutions. Experiments have been conducted using radioactive thorium nitrate as an electrolyte in a small reactor operating with less than 500 volts and at temperatures up to 500˚F and pressures up to 50 atmospheres. The preliminary experimental results are that high-density charge clusters can be used to produce nuclear reactions in a relatively low-energy environment.

Introduction

The previously-published experimental protocols were used [1] in the experiments reported in this paper. A cylindrical zirconium electrode together with an axis-centered zirconium disk electrode were arranged so that the cylindrical electrode with Teflon™ end caps is a small pressure vessel. See Figure 1. The reactor is partially filled using 25 ml. of a thorium nitrate {$Th(NO_2)_4$} solution. The two electrodes are connected to a variable, alternating current power supply for a period of thirty minutes or longer (depending on the amount of thorium nitrate used in the electrolyte). Thorium nitrate was chosen because the mildly radioactive thorium and its daughter elements allow for tracking changes in radioactivity without the necessity of using a "hot lab." Thorium $_{90}Th^{232}$ is one of the naturally-occurring radioactive nuclides and Table I shows its half life of 14 billion years and its decay series.

In the course of a few dozen experiments, similar, but not identical results were obtained. More than 50% of the thorium is typically removed from the electrolyte in 30 to 90 minutes of processing. The disk electrode (if removed immediately after the processing time) has shown an increase in radioactive emissions that peaks in two to ten hours. Emissions from the complete reactor, the disk electrode, the electrolyte, and the electrolyte plus precipitates have been measured variously by using a Geiger-Muller tube, a portable alpha detector, a gamma-ray spectroscope by using a two-inch long by two-inch diameter sodium iodide crystal gamma-ray detector (Ludlum Measurements, Model 44-10D), connected to an Aptec multi-channel analyzer installed in an IBM-compatible personal computer. The latest gamma-ray spectroscopy has been accomplished using an ORTEC™ (EG&G Instruments, Inc.) liquid-nitrogen-cooled, high-purity germanium, gamma-ray detector. The surfaces of both the disk electrode and the inner surface of the cylindrical electrode are pitted and cratered. The pitting/cratering is explained by small explosive-like nuclear reactions produced by the high-density charge clusters. The charge clusters are believed to be formed by an explosive electron emission initiated by field emission of electrons from the metal/metal-oxide layer of the zirconium electrodes [4].

Careful measurements of the gamma-emission radioactivity of the entire reactor shows a decrease in emissions after processing. Due to the weak gamma-ray emission from the thorium, the thick walls of the reactor, and the background radiation from cosmic rays, radioactive contaminants in the germanium crystal or nearby, and the particular source to be measured (via scattering, X-ray production, beta particles, or bremsstrahlung) most of the pre-processing gamma-rays are from the small amounts of thorium daughter elements. If the minute amounts of daughter elements do not participate in the nuclear reactions, there will be little change in the after-processing gamma-ray measurements. As discussed later, significant changes in pre- and post-gamma-ray emission occurs.

Historical Background

The first person to discover and utilize high density charge clusters was Kenneth R. Shoulders [8,9]. Initially, Shoulders was primarily interested in charge clusters as the basis for high-speed computer components. Later, Shoulders discovered that the characteristic strikes of high-density charge clusters could produce nuclear reactions in certain target materials in micrometer-sized areas [5].

High-density charge clusters were discovered independently by A. Ilyanok, a scientist in Minsk, Republic of Belarus [10]. Ilyanok had also devised a method for flat-panel display using this charge cluster technology which was similar to one of Shoulders' embodiments in his patents. The third independent discovery of high-density charge clusters was reported by G. A. Mesyats [11] some ten years after Shoulders' discovery. Mesyats has named his charge clusters "Ectons".

Stan Gleeson and Rod Neal made a discovery that under certain conditions, using special cathodes, that nuclear reactions could be produced in an aqueous solution. The first published paper of this exciting discovery was presented at the

Table I. Thorium Decay Daughter Elements

Element	Half-Life	α (MeV)	β (MeV)	γ (KeV)
Thorium-232	1.4 x 10^{10}y	4.01, 3.95	—	59 (weak)
Radium-228	5.76 y	—	.039, .015	30 (weak)
Actinium-228	6.15 h	—	1.2, 2.1	911, 969, 338
Thorium-228	1.91 y	5.42, 5.34	—	84, 216, 132, 166
Radium-224	3.66 d	5.69, 5.45	—	241
Radon-220	55.6 s	6.29	—	550
Polonium-216	0.145 s	6.78	—	805 (weak)
Lead-212	10.6 h	—	.331, .569	239, 77, 75, 87, 300
Bismuth-212	60.6 m	6.05	2.25	727, 1621
Polonium-212	298 ns	8.78	—	—
or Thallium-208	3.05 m	—	1.8, 1.28, 1.52	2615, 583, 511, 860, 277
Lead-208	stable			

Sources: Lapp *et al.* [2], Hunt [3] plus updated values from other sources.

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second International Conference on Low-Energy Nuclear Reactions [12]. The methods by which certain metals could produce charge clusters in aqueous solutions was examined by Bhadkamkar and Fox [4]. The authors have conducted significant experiments using a variety of metals that demonstrate electroluminescence and charge cluster formation.

The production and control of high-density charge clusters carrying positive ions is expected to be developed into a system for the amelioration of high-level radioactive wastes. That such high-density charge clusters can be produced is an experimental fact also shown by others [5,6]. The stability of such charge clusters has been analytically treated and shown to be toroidal in form and to produce extremely high local electric and magnetic fields [7]. Due to the high electron to positive-ion ratio, a combined charge cluster can be accelerated to high impact energies using relatively low potentials. A 5,000 volt potential can provide such combined charge clusters with velocities of more than one-tenth the speed of light. It is standard physics that positive ions (such as protons) can produce nuclear reactions at such velocities. A proton particle accelerator would require about nine million volts to produce one-tenth light-speed velocities. Therefore, table-top particle accelerators, based on charge-cluster technology, are expected to be designed and used to produce nuclear reactions.

Experiments and Results

A specially designed reactor is filled with 25 ml. of a thorium nitrate aqueous solution. The amount of elemental thorium placed into the reactor has ranged from 0.1 to 0.5 grams. The reactor is connected to the output of a power supply with the primary voltage of a 2 kVA transformer controlled using a variable transformer. The a.c. voltage to the reactor is gradually raised and the voltage, amperage, and temperature are recorded. Computations for the cell resistance shows that the resistance initially decreases as the temperature of the reactor increases. Further processing results in a gradual increase in cell resistance until the voltage is in the range of 300 to 500 volts and the current is well below 0.5 amperes. Care is taken to increase the power input to the cell by small steps while monitoring the cell temperature. The cell temperature should not exceed 500°F due to the temperature limits of the Teflon™ used as end caps and seals for the reactor.

A typical experiment results in the removal of the thorium from the electrolytic solution; an erosion of both electrodes; and the formation of a small amount of precipitate. The precipitate is mainly a finely-divided metal oxide plus any elements formed during the experiment. The visual evidence on the electrodes is the formation of numerous small pitted areas where the charge clusters have formed or impacted.

A typical chemical analysis of the pre-processed electrolyte and the post-processed electrolyte shows a dramatic decrease in the amount of elemental thorium. In one of the earlier experiments the thorium was reduced from 4300 to 9.5 parts per million in thirty minutes of processing time.

GAMMA-RAY EMISSIONS BEFORE AND AFTER PROCESSING FROM COMPLETE REACTOR: As shown in Figure 1, the reactor is composed of a cylindrical electrode with a central disk electrode. Fig. 2 shows how the entire sealed reactor has been placed in the lead-shielded chamber of the gamma-ray spectroscope in order to make accurate determinations by minimizing the geometry effect. As shown in Figure 2, the radioactive solution fills the bottom half of the cylindrical reactor. After processing, there are precipitates that collect at the bottom of the cylinder. If the reactor were placed very close to the end of the germanium detector, it could be argued that the measured reduction in radioactivity was an artifact of the geometry. With the particular geometry used (locating the reactor 13 cm from the end of the germanium detector) the reduction in gamma-ray emission due to the possible change in location of the thorium (and daughter elements) is greatly reduced. Although somewhat difficult to calculate due to the fact that the distribution of the precipitates is not completely known, the authors claim that the geometry would not account for as much as ten percent change in the gamma-ray measurements.

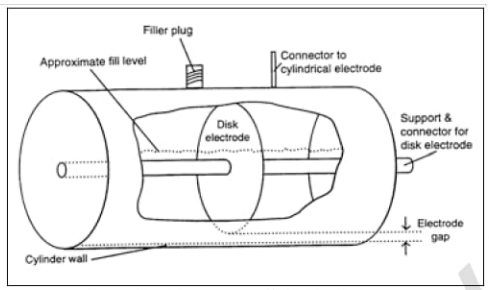

Figure 1. Cut-away of LENT-1 Reactor

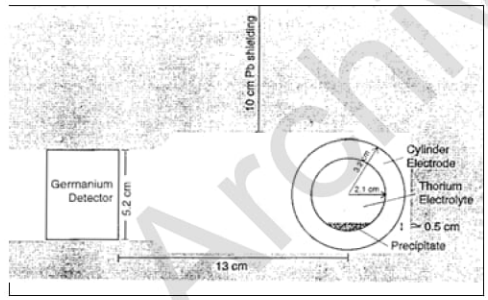

Figure 2. Geometry of Gamma Ray Detection

In order to claim that the transmutation is not limited to just one elemental mass, such as thorium-232, data has been examined for elemental masses ranging from actinium-228 to thallium-212 as shown in Table II. Also by using other experimental data, the authors hypothesis is that from the range of lead to thorium the transmutation appears to be about the same for all elements within this range. Preliminary work done by others using uranium and also using cesium-137 promotes the hypothesis that the use of high-density charge clusters can provide for nuclear reactions across most, if not all, of the periodic table.

The above data was taken from one recent experiment in which 0.5 grams of thorium was added to the cell. The before and after spectra for the entire cell are shown in Figure 3a and Figure 3b. These figures show the counts taken for 3600 seconds for the gamma-rays emitted by the lead-212 daughter element of the thorium. The overall reduction of gamma-ray emissions from the total reactor assembly (see Figure 2) is about fifty percent. The importance of the data in Table II (as obtained from the analyses of the spectra shown in Figure 1) is to demonstrate that the measure of gamma-ray emissions is reduced about the same for a range of elements. This data was taken without the cell being opened. All gamma-ray emissions had to penetrate the 1.1 cm. thick wall of the cylindrical electrode. The positioning of the closed reactor at 13 cm. from the germanium sensor was to minimize the effects of precipitate geometry. *The conclusions are that the observed reduction in gamma-ray emissions are the result of transmutation of thorium daughter elements and not an experimental artifact.*

Table II. Gamma-Ray Counts for some Thorium Daughter Elements

Element (Isotope)	Gamma Energy (KeV)	Before Processing Net Counts/ hr	After Processing Net Counts/ hr
Actinium-228	911.07	127 ± 11	66 ± 8
Lead-212	238.63	421 ± 22	204 ± 16
Bismuth-212	727.17	40 ± 7	26 ± 6
Thallium-208	538.14	217 ± 15	105 ± 11

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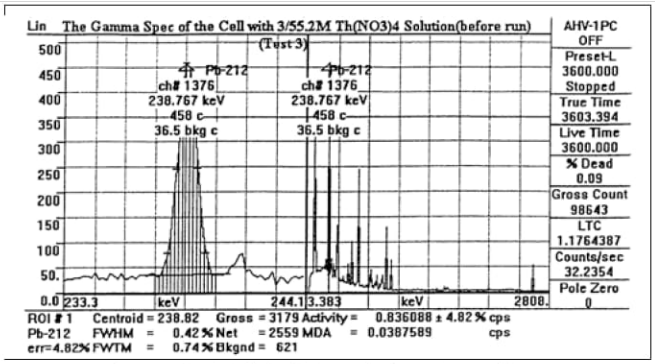

Figure 3a. Total Cell Count before Processing.

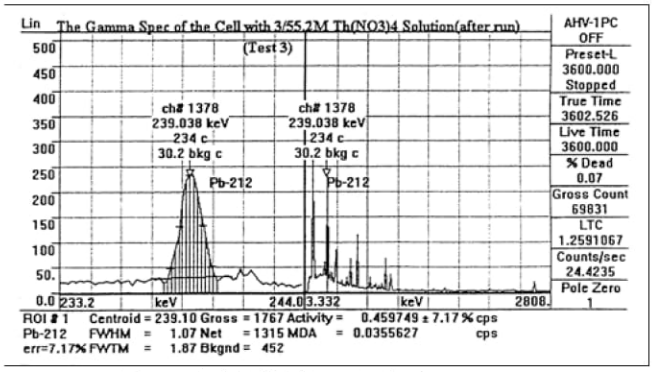

Figure 3b. Total Cell Count after Processing.

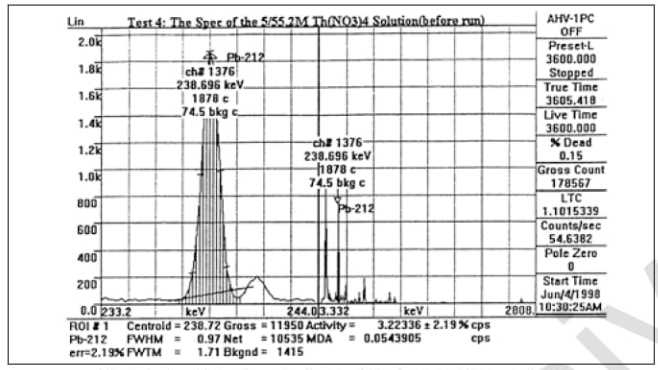

Figure 4a. Spectra of Electrolyte before Processing.

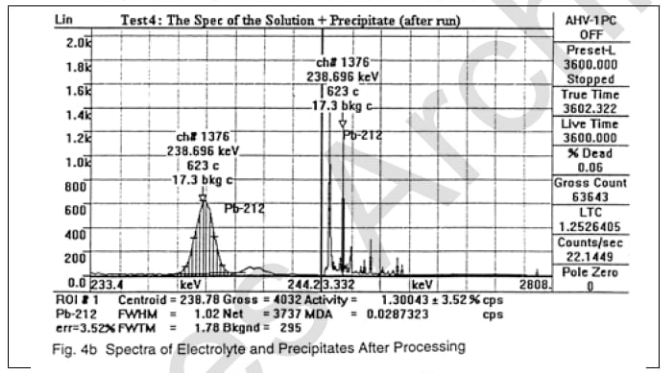

Figure 4b. Spectra of Electrolyte and Precipitates after Processing.

TRACKING THE MOVEMENT OF THE THORIUM: Although the thorium is radioactive and continually produces a range of daughter elements (as shown in Table 1) the thorium itself is very difficult to detect by measuring radioactivity. Although the thorium-232 emits a gamma photon of 59 Key, the abundance of the photon is only about 0.2 percent and difficult to detect. *Therefore, we make measurements of the daughter elements of the thorium disintegration.* It is the authors' working hypothesis that the daughter elements from the natural radioactive decay of thorium will be treated in the reactor much the same way as the thorium nuclei. This hypothesis is based on data from previous commercial laboratory tests which measured the pre-and post-processing amounts of various daughter elements in both control and spent solutions.

Chemical measurements show that considerable thorium is removed from the electrolyte during processing. The initial evidence is the decrease in the conductivity of the electrolyte that is observed during the processing interval. If there is no transmutation of the thorium (and its daughter elements) then these elements must be found on the electrodes or in the precipitates. Specific data from micro-chemical or mass spectroscopy will be appended to this paper as soon as the commercial laboratory results are available.

MEASUREMENTS OF THORIUM IN THE SOLUTION AND PRECIPITATES: A new set of experiments were accomplished by using a new cylinder electrode. A new disk electrode is used with each experiment. The amount of thorium introduced into the electrolyte was 0.5 grams. After the experiment was completed the reactor was left intact (not opened) for several days (Friday until Monday). The reactor was opened and the precipitates decanted from the spent solution and measured for the degree of radioactivity. There is a significant amount of radioactivity in the precipitates caused by the presence of some of the thorium daughter elements. A compari-son of the gamma-ray emissions from the original electrolyte (before processing) is compared with the processed electrolyte plus the precipitates in the following Table III. Because the size of the containers used with the germanium detector, there can be only negligible effects from the geometry of the two samples.

The actual gamma-ray spectra of the electrolyte plus the precipitates and the gamma-ray spectra of the initial electrolytic solution are shown in Figure 4a Figure 4b. The same size small containers were used and the position of the containers with respect to the germanium detector was the same.

The result of this particular experiment supports the concept that the amount of radioactivity in the initial solution was significantly decreased in the spent solution and precipitates. In this experiment, the lead-212 counts were reduced by 67 percent.

MEASUREMENTS OF THORIUM DAUGHTER ELEMENTS ON THE ELECTRODES: Because the electrodes are eroded during the processing time by the action of the highly-dynamic charge clusters, it is reasonable to assume that there would be little buildup (or plating) of the thorium (and daughter elements) on the electrodes. The following procedure has been used to determine the amount of thorium (and daughter elements) on the electrodes:

The disk or cylinder electrode is placed a precise distance from the detector in the leadshielded gamma-ray spectroscope. The gamma-ray counts are stored by energy level in the 16,384-channel Aptec multi-channel analyzer. The gamma counts are continued for thirty or

TABLE III. Comparison of Gamma-Ray Emissions from Initial Solution and with Precipitates

(After processing is solution plus precipitates. Count data is net counts per hour.)

Element (Isotope)	Gamma Energy (KeV)	Initial Solution	After Processing With Precipitates
Actinium-228	911.07	195 ± 14	75 ± 9
Lead-212	283.63	1849 ± 44	612 ± 25
Bismuth-212	727.17	76 ± 9	31 ± 6
Thallium-208	538.14	459 ± 22	147 ± 13

Note: The above data does not represent the maximum changes in gamma-ray reduction that has been achieved.

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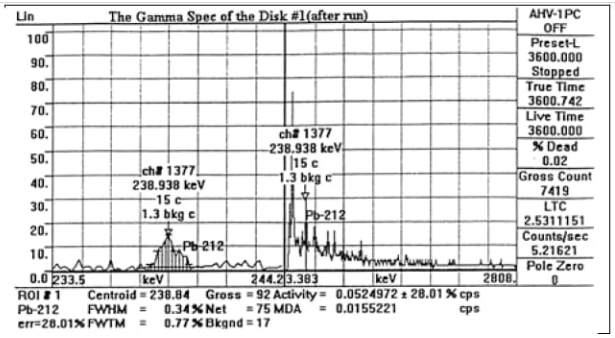

Figure 5a. Spectra of Disk Electrode

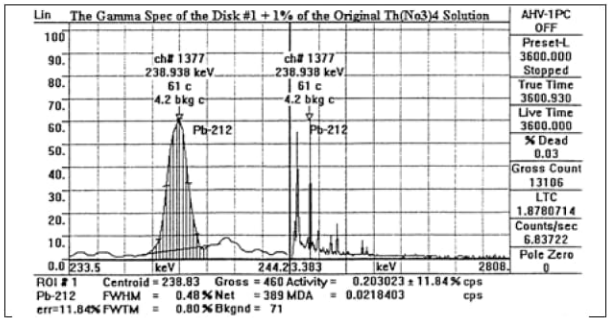

Figure 5b. Spectra of Disk Electrode Plus 1% of Added Thorium

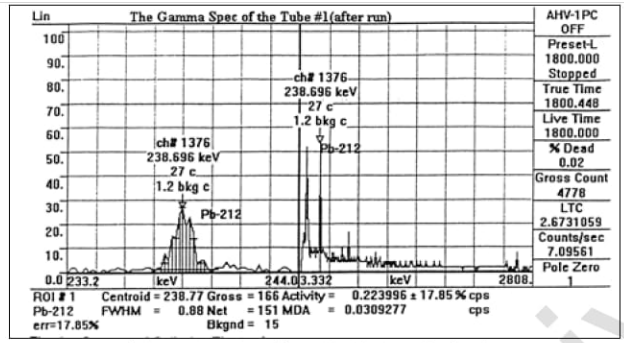

Figure 6a. Spectra of Cylinder Electrode

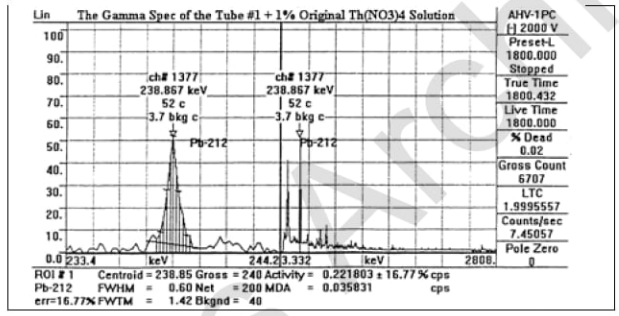

Figure 6b. Spectra of Cylinder Electrode Plus 1% of Thorium

multi-channel analyzer. The gamma counts are continued for thirty or sixty minutes. The most predominant daughter element of the thorium on the gamma-ray spectrograph is the lead-212 having an energy of 239 keV (see Table I). See Figure 5a where the net value of the counts for the lead-212 shows a net value (peak counts minus background counts) of 14 counts/hr for a typical disk electrode.

The next step was to place one percent of the original solution of thorium nitrate (from the control half of the pre-processed solution sample) onto the disk electrode. The disk electrode was then gently heated to evaporate the water. This process provides a disk electrode that has been loaded with one percent of the amount of thorium (and daughter elements) from the original solution. This disk was placed into the gamma-ray spectroscope in the same position as previously used. The results from the same counting period are shown in Figure 5b. The net counts for the same channel (for the lead-212) measured 57 per hour. These careful measurements show that the amount of thorium (or daughter elements) that are normally present on the disk electrode after processing amounts to less than one-fourth of one percent of the original amount of the thorium (or daughter elements). *Conclusion: there is a very small amount of thorium (or daughter elements) that is contained on the disk electrode.*

A similar procedure was used to measure the amount of thorium (or daughter elements) that may be found on the cylinder electrode. In this case the cylinder electrode used for measurements had been used for a total of over thirty similar experiments. Fig. 6a shows the results of the gamma-ray spectra with a net 26 counts for the lead-212 channel. After the addition of one percent of the original solution onto the center of the cylinder electrode the net counts as shown in Fig. 6b were 49 in 30 minutes. *Conclusion: after many experiments the total amount of thorium (or daughter elements) contained on the cylinder electrode is not more than one-half of one percent of the amount of thorium contained in the electrolyte in one experiment.*

The Use of High-Density Charge Clusters

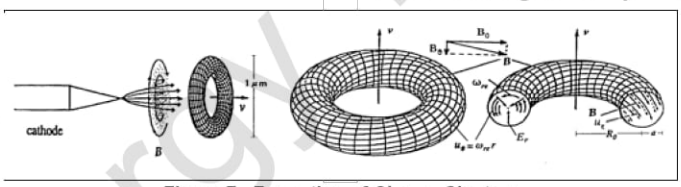

Figure 7. Formation of Charge Clusters

High-density charge clusters can be created in various fluids such as low-pressure gases, at atmospheric pressure, and in some liquids using specially-prepared electrodes. A single charge cluster, created from a specially-prepared electrode in liquids or from a cathode in gases is normally about one micron in diameter (see Figure 7). With more energy several charge clusters ranging from about one-half to three microns form into a ring-shaped form with a diameter of about 20 microns and travel like a smoke ring (direction of travel perpendicular to the plane of the ring of clusters). As shown in Figure 7, the high dynamics of the rotating electrons (considered to be spiraling around the outer surface of the toroid) create a very high internal magnetic field. According to the analytical model [7], the local strength of the magnetic and electric fields are much stronger than previously produced in laboratories.

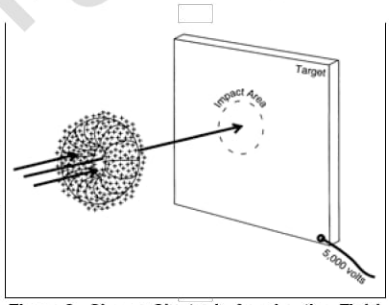

Figure 8. Charge Cluster in Accelerating Field

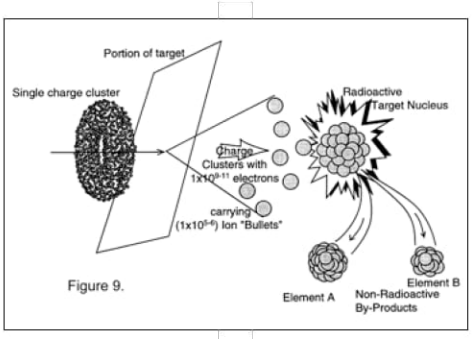

Figure 9.

The local strength of the electric field is strong enough to completely ionize the material of any dielectric that is in the path of the charge cluster. Therefore, a typical charge cluster can drill holes through aluminum oxide leaving evidence that this

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refractory material was vaporized [8]. Some preliminary calculations would indicate that the melting of such a small bore cylinder could require several times as much energy as used to create the charge cluster. A possible explanation is that some nuclear reactions occur in the aluminum oxide and provide energy to the charge cluster. Shoulders' experiments support this explanation [5].

When the charge cluster is created in an ionizable fluid, the charge cluster creates many positive ions and transports about one positive ion for each 100,000 to one million electrons in the charge cluster (see Figure 8). Under the influence of an accelerating field the combined charge cluster can achieve velocities required to create nuclear reactions in a target material. The target material may be the anode in a low-pressure gas or an ion in a liquid.

With sufficient potential, the positive ions carried by charge clusters can create nuclear reactions (see Figure 9). The positive ion velocity must be sufficient to penetrate the Coulomb barrier of a target nuclei. To explain some of the observed nuclear reaction products [1,5,6,16], the authors suggest that multiple-body reactions may be involved where two or more positive ions penetrate a target nuclei. A more complete discussion of this possibility will be the topic of a planned future paper.

It is important to note that the electron density in the high-density charge clusters is 10^{10} to 10^{12} times higher than the electron density in the Intense Relativistic Electron Beam (IREB). Therefore, the efficiency of collective ion acceleration of the charge cluster would be several orders of magnitude higher than previously achieved by IREB [13,14]. As a result, there will be many applications for the production and use of high-density charge clusters. New inventions are expected for many scientific and engineering applications. Among the more important applications are the use of such high-density charge cluster technology for the on-site stabilization of both liquid and solid (after reducing to small particles) high-level radioactive wastes.

Experimental Conclusions

The experimental evidence from the authors' work and from the cited work of others provides the following experimental facts:

1. High-density charge clusters can be produced in many fluids.
2. High-density charge clusters can ionize materials having suf ficient resistivity.
3. Under some conditions high-density charge clusters can col lectively accelerate ions and produce nuclear reactions.
4. Nuclear reactions can be produced using less than 5,000 volts.
5. Experiments with high-density charge clusters has proven that low-energy nuclear reactions are an experimental fact.

Qualified scientists working in various laboratories in several countries (including papers provided at two International Conferences on Low-Energy Nuclear Reactions [15]) have laid the groundwork for an important new technology. These new discoveries are important, first; to provide new insights into nuclear reactions and second; to provide new devices and systems for handling radioactive wastes, for creating clean energy, and for creating scarce elements from plentiful elements.

Future Efforts

Further experimental work is planned using the germanium sensor in the gamma-ray spectroscope and mass spectrometer. The experiments will be designed to track the type of nuclear reactions that are being produced. It is hypothesized that protons are injected into the nuclei of heavy elements (such as thorium) and produce a nuclear instability resulting in fissioning of the heavy nuclei into smaller fragments. Due to the sparsity of neutrons produced from this type of reactor, it is further hypothesized that the nuclear fragments are neutron rich and decay by beta emission (where excess neutrons become protons). It is hypothesized that a part of the observed radioactive decay of the disk electrode is explained by the beta-emission processes where neutron-rich isotopes decay to stable elements over a period of a few hours to a few days after processing. Further experiments to determine the validity of this hypothesis are planned.

The complete elemental analysis of all components of the low-energy nuclear reactor currently being used will be accomplished and appended to this paper. Additional experiments will be conducted using naturally-radioactive uranium salts. Arrangements are being negotiated to have similar experiments accomplished in a laboratory suitable for working with high-level radioactive wastes.

Acknowledgements

The authors wish to thank the staff of Aptec Nuclear Inc. and the staff of the ORTEC division of EG&G Instruments, Inc. for their support and help in building and operating the gamma-ray spectroscope. In addition, the authors thank the management of Western Zirconium for their support. Most important, the authors are deeply indebted to the program managers of the American Nuclear Society for extending an invitation to present information about this important new technology at the 1998 annual meeting (June 7-11, 1998 in Nashville, Tennessee).

References

1. Cincinnati Group, "Protocol for Thorium Activity Remediation," *Infinite Energy*, Vol. 3, No. 13 & 14, 1997, pg 17.
2. R.E. Lapp and H.L. Andrews, *Nuclear Radiation Physics*, (1992), Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
3. S.E. Hunt, *Nuclear Physics for Engineering and Scientists*, 1987, Ellis Harwood, Ltd., Market Cross House, Cooper St, Chichester, W Sussex, P019 1EB England.
4. Atui Bhadkamkar and Hal Fox, "Electron Charge Cluster Sparking in Aqueous Solutions," *J. of New Energy*, Winter 1997, Vol. 1, No. 4, pp. 62-67, 2 figs 28 refs.
5. Ken Shoulders and Steve Shoulders, "Observation on the Role of Charge Clusters in Nuclear Cluster ReactionsN, *J. of New Energy*, Vol. 1, No. 3, Fall 1996.
6. F. Celani *et al.* (Rome, Italy), "Preliminary Results with Cincinnati Group Cell of Thorium Transmutation under 50 Hz AC Excitation." paper obtained at ICCF-7, Vancouver, April 17-23, 1998.
7. Shang-Xian Jin and Hal Fox, "Characteristics of High-Density Charge Clusters: A Theoretical Model, *J. of New Energy*, Vol. 1, No. 4, pg. 5, Winter 1996.
8. Kenneth R. Shoulders, *EV. A Tale of Discovery*, 1987.
9. Kenneth R. Shoulders, "Energy Conversion Using High Charge Density", U.S. Patent 5,018,180, issued May 21, 1991. See also patents 5,054,046 and 047 (1991); 5,123,039 (1992); and 5,148,461 (1992).
10. A. llyanok, personal communication, circa 1994.
11. G.A. Mesyats (Institute of Electrophysics, Russian Academy of Sciences, 34 Komsomolskaya St., Ekaterinburg 620049, Russia), "Ecton Processes at the Cathode in a Vacuum Discharge, *Proceedings, Vol. II, XVIIth International Symposium of Discharges and Electrical Insulation in Vacuum*, Berkeley, California, July 21-26, 1996, pages 720-731, 5 tables, 10 figs, 38 refs.
12. Robert Bass, Rod Neal, Stan Gleeson, and Hal Fox, "Electro-Nuclear Transmutation: Low-Energy Nuclear Reactions in an Electrolytic Cell," *J. of New Energy*, Vol. 1, No. 3, Fall 1996, pp. 81-87.
13. C.L. Olson and U. Schumacher, *Springer Tracts in Modern Physics. Vol 84: Collective Ion Acceleration*, Springer-Verlag, 1979.
14. S.X. Jin, "The Comparison of Some Characteristic Parameters Between Intense Relativistic Electron Beam (IREB) and High-Density Charge Clusters (HDCC)," unpublished paper, 1998.
15. Hal Fox, editor, *Proc. First International Conference on Low-Energy Nuclear Reactions*, *J. New Energy*, Vol. 1, No. 1, Jan. 1996. *Proc. Second Intern'l Conference on Low-Energy Nuclear Reactions*, *J. New Energy*, Vol. 1, No. 3, Fall 1996.
16. A.B. Karabut, Ya.R. Kucherov, l.B. Savvatimova, "Possible nuclear reactions mechanisms at glow discharae in deuterium," *Frontiers*

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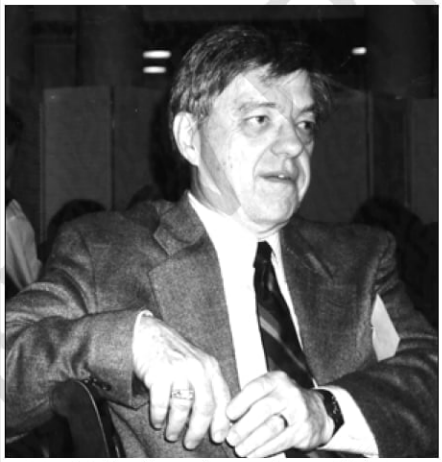
Society for Scientific Exploration (SSE) Meets in the Land of Jefferson

by Eugene Mallove, Member, *SSE*

It wasn't easy taking three days off editorial and lab duties in Bow, New Hampshire to travel to Charlottesville, Virginia—the hot and humid homeland that Thomas Jefferson, a most outstanding scientist-U.S. President, knew so well. I attended the always-stimulating Annual Meeting of the Society for Scientific Exploration (SSE), my favorite organization (apart from *Infinite Energy* Magazine!). It was good to renew old friendships in person and meet with like-minded people investigating other anomalies on the frontiers of science. Unlike cold fusion and new energy, which are now in a commercial development phase, even as theory continues to lag, *some* of these SSE anomalies may turn out to be ephemeral or ultimately impossible to reach firm conclusions about. Others, when fully understood, will no doubt become part of accepted scientific knowledge. The spirit of open-mindedness within SSE and the tolerance of a range of scientific pursuits is a very precious thing—especially in a world in which arrogant bigotry against frontier science reigns supreme.

Dr. Bernard Haisch, Editor-in-Chief of SSE's quarterly *Journal of Scientific Exploration*, and Executive Editor, Marsha Sims, at 1998 SSE Meeting. The international scientific magazine has experienced explosive growth in the past year. *(Photo: EFM)*

I gave the attendees, plus several invited journalists (one from the *Washington Post*), a status report on cold fusion, and it was another chance to spread the word about *Infinite Energy*. (*Cold Fusion: A Status Report and Assessment of Media Coverage*—yes, and I did it in 10 minutes flat by hitting just the highlights!) The 1998 meeting attendance was a respectable 120 to 150. Within the SSE's approximately 700 members worldwide, many holding doctorates in their fields, are several cold fusion and new energy people—among them Dr. John O.'M. Bockris, Dr. Hal Puthoff, and Dr. M. Srinivasan. These three also attended the 1998 meeting. Many non-members subscribe to the SSE's intellectually stimulating peer-reviewed journal, *The Journal of Scientific Exploration*, which now appears quarterly (see the ad on page 85 of this issue, which we run regularly as a *public service*). *JSE* 's Editor-in-Chief is astrophysicist Dr. Bernard Haisch and the Executive Editor is his wife, Marsha Sims. The journal's web site is: http://www.jse.com.



Physicist Dr. Hal Puthoff of the Institute for Advanced Studies, Austin, Texas, a key member of SSE and an expert on the physics of Zero Point Energy. *(Photo: EFM)*

This 17th Annual SSE Meeting did not disappoint. The last time I had attended an SSE meeting to talk about cold fusion was in 1994 in Austin, Texas. This one was held May 28-30 in Room 140, Clark Hall, at the University of Virginia, Charlottesville campus. A glance at the meeting program pretty much tells all about the kinds of topics considered within the purview of SSE (see the adjacent listing of the formally printed meeting program—most of which went as scheduled).

One big disappointment, in an otherwise remarkable meeting: The panel discussion by the journalists toward the end revealed that these journalists (see program for affiliations) seemed to be totally obtuse regarding the implications of scientific anomalies and how they should or should not report them. In particular, the young journalist from the *Washington Post* defended the ludicrous idea there is no "bunker mentality" in mainstream science against new ideas such as were discussed at the meeting. Well, if so, why as an example was cold fusion not being covered? My pointed remark to them in open forum was that their discussions confirmed my *worst* fears about science journalists. They just don't "get it." They still think that they are partners in arbitrating truth, in which they refuse to dispense what they consider "bad information"—information their "handlers" in the scientific establishment deem "bad," of course.

At each SSE meeting, I find there is one very unexpected, extremely high quality, and utterly baffling paper—one that just might have some profound bearing on physics, if not on life itself. At this meeting, the shocker to me was the paper by Lewis Hollander—a mainstream physicist who has had a lot to do with the development of the semiconductor industry in the United States. He was there "at the beginning," working with some of the great and big names in semiconductor integrated circuit development. He is also a successful businessman, a rancher, and a triathlon participant. On page 33 is the full abstract of his talk:

Continued on page 33

SSE member Prof. Robert Jahn of Princeton Univ. and PEAR (Princeton Engineering Anomalies Research). Former Dean of Engineering at Princeton, Jahn is one of the foremost authorities on experimental evidence for what are usually called psychic phenomena. *(Photo: EFM)*

Printed Program of the 17th Annual Meeting of THE SOCIETY FOR SCIENTIFIC EXPLORATION May 28-30, 1998

Wednesday Evening - May 27
Cavalier Inn, Charlottesville, VA

6:00- 7:00 Introductory Seminar for Young Investigators - Robert Jahn, PEAR, Princeton University

7:00 Opening Reception

Thursday Morning - May 28

9:00 Opening Remarks - Gene Bloch, Vice President for Research, University of Virginia

9:20- 9:50 Psychological Profiles of Conjoined Twins: Heredity, Environment and Identity - J. David Smith, Longwood College, Farmville, VA

10:00-10:30 The Heart is Not a Pump: A Refutation of the Pressure Propulsion Premise of Heart Function - Ralph Marinelli, Rudolf Steiner Research Center, Royal Oak, MI [*Editor's Note: This was perhaps the most controversial paper at the meeting—and was received with much skepticism even by the generally open-minded SSE'ers.*]

10:40 Break

11 :00- 11:30 A Center to Test the Efficacy of Selected Complementary and Alternative Therapies in Reducing Pain and Distress in Selected Patient Populations - Ann Taylor, University of Virginia, School of Nursing

11:40- 11:50 Ideas for a New Biology - Angela Thompson-Smith, Inner Vision Research Institute, Las Vegas, NV

11:55-12:05 The Unifying Concept of Information in Biology and Medicine - Beverly Rubik, Institute for Frontier Science, Oakland, CA

12:10-12:20 Complementary Medicine Treatment of Neurological Disorders Using the Cayce Wet Cell Battery - Douglas Richards, et al, Meridian Institute, Virginia Beach, VA

12:25 Lunch

Thursday Afternoon - May 28

2:00- 2:30 The Dinsdale Prize Lecture - Ian Stevenson, University of Virginia. "What are the Irreducible Elements of Scientific Research?"

2:40- 3:10 William James's Passionate Advocacy of Alternative Healing - Eugene Taylor, Harvard Medical School

3:20 Break

3:40- 3:50 Positive Therapeutic Effect of Distant Healing in an Advanced AIDS Population - Fred Sicher, et al, Geraldine Brush Cancer Research Institute

3:55- 4:05 Does Recurrent Isolated Sleep Paralysis Involve More than Cognitive Neurosciences? - Jean-Christophe Terrillon, Advanced Telecommunications Research Institute, Kyoto, Japan

4:10-4:20 Stress and Adaptation Processes Aspects of Reflexotherapy with "Psychic Fluids" - Ion Lisii, Romanian National Association of Complementary Therapies, Bucharest, Romania

4:25-4:35 Mechanic Microdynamics Incorporated into the Macrodynamics of Natural Autowave Systems and Controlling Them - Andrey Berezin, Oil and Gas Research Institute, Russian Academy

4:40-4:50 Physical and Logical Basis of Semantic Phase of Cognition and Dynamics of Complex Systems - A. Volodin, Oil and Gas Research Institute, Russian Academy.

4:55-5:05 Mechanisms of Cognition. Logic. - L. I. Popov, Oil and Gas Research Institute, Russian Academy.

5:10-5:20 What if All There Really Is, Is Mind? - H. D. Froning, Jr., Flagstaff, AZ

5:25- 5:35 Unexplained Weight Gain Transients - Lewis Hollander, Redmond, OR

5:40 End

Friday Morning - May 29

9:00 Announcements

9:10- 9:40 Just How Common are Near-Death Experiences? A Survey of Surveys - Bruce Greyson, University of Virginia

9:50-10:20 Near-Death Experiences with Reports of Meeting Deceased Relatives - Emily Williams Cook, University of Virginia

10:30 Break

10 50-11 20 New Cases of Experimental Birthmarks - Jim B. Tucker, University of Virginia

11:30-11:40 A Model of Circular Migration Does Population Growth Rule Out Reincarnation? - David Bischai, Johns Hopkins University

11:45-11:55 After-Death Communication - Judy Guggenheim, ADC Project, Longwood, FL

12:00-12:10 Medium to Departed Medium Communication of Pictorial Information - Gary Schwartz, *et al.,* University of Arizona

12:15-12:25 Channeling Ramtha: Is it a "High Risk" Procedure? - Stanley Krippner *et al.,* Saybrook Graduate School

12:30 Lunch

Friday Afternoon - May 29

2:00-2:10 Parapsychology in the 30's - The Intellectual Context at Duke -Robert Creegan, SUNY. Albany, NY

2:15- 2:25 Arguing for an Observational Theory of Paranormal Phenomena - Joop Houtkooper, Justus Liebig University, Giessen, Germany

2:30- 2:40 Interpersonal Registration of Actual and Intended Eye Gaze: Relationship to ESP and Survival of Consciousness Experience - Linda Russek and Gary Schwartz, University of Arizona

2:45-2:55 Correlations of Solar Activity and Earthquake Moment -John Derr, Albuquerque Seismological Lab, and Michael Persinger, Laurentian University, Ontario

3:00-3:10 The Saguenay. Quebec Earthquake Lights, November - December, 1988 - France L. St. Laurent, Commission Scolaire du Sault-St-Louis, Quebec, and John Derr, Albuquerque Seismological Lab

3:15 Break

3:35-3:45 The Scientific Method as Defined by the Hunefer Papyrus of the XIX Dynasty of Ancient Egypt - Rush Allen, Orange, CA.

3:55-4:05 Nibiru, Planet X: Evidence from Antiquity for the Position of Its Orbit and Its Current Position - Richard Day, University of Cincinnati

4:10- 4:20 Plentiful Enlightenment of Ancient Experiment Sciences - Tao-qiu Chen, The Chinese Society of Somatic Science, JiangSu Province, China

4:25- 4:35 Menstrual Periods and Quantum-Periods - Arnold Lettieri, Jr., Hopewell, NJ

4:40- 4:50 The Phi Streamline Principle - The Path of Least Resistance in Nature and Technology - John Petersen, The Arlington Institute, Arlington, VA

4:55 Break

5:05 Business Meeting

9:00 Open House at McCormick Observatory (weather permitting) (Vans shuttle from the Cavalier Inn)

Saturday Morning - May 30

9:00 Announcements

9:10- 9:40 Earth Heat Balance and Climate: A Tutorial - H. Grant Goodell, University of Virginia

9:50-10:20 Global Warming: Ten Years of Hot Air - Pat Michaels, Virginia State Climatologist, Charlottesville, VA

10:30 Break

10:50-11:00 Anomalies in the History of Relativity - Ian McCausland, University of Toronto

11:05-11:15 What Can Elementary Particles Tell Us About the Space in Which We Live? - Ronald Bryan, Texas A&M University

11:20-11:30 Exploring What Changes Might Be Made in the Philosophy of Science in order to Allow for a Theory of Truly Everything - Charles Bemer, Merimbula, NSW, Australia

11:35-11:45 Statistics, Subjectivity, and Consciousness: An Introduction to the Origins of Probability Theory - Michael Partridge, Sante Fe, NM

11:50-12:00 Effects of Perceived Success or Failure in Anomalies Experiments - York Dobyns, PEAR, Princeton University

12:05-12:15 Cold Fusion: A Progress Report and Assessment of Media Coverage - Eugene Mallove, Cold Fusion Technology, Inc. Bow, NH

12:20-12:30 The Mars Data-Base and an Heredity Effect- Francoise Gauquelin, Paris, France

12:35 Lunch

Saturday Afternoon - May 30

2:00- 2:40 Science and the Scientific Exploration of Anomalies: An Empirical Comparison and Some Normative Comments - Henry Bauer, Virginia Tech

2:50- 3:20 News Reporting of Anomalies and Anomalies Research: General Remarks by:

- Joel Achenback, Staff Writer, *Washinton Post*, The Age of Bad Information
- Mark William Logas, WVIR TV/NBC, Charlottesville, Space Technology Makes Learning Fun
- Sarah McConnell, WINA-Radio, Charlottesville, Science Needs a Public Advocate
- Beverly Orndorf, *The Richmond Times Dispatch*, We Think in Herds
- Tom Shroder, *Miami Herald,* Bridging the Comprehension Gap
- Raymond Villard, Public Information Officer, Space Telescope Science Institute, Through Rugged Ways To The Stars: Communicating Hubble Telescope Discoveries To The Public

3:20 Break

3:40-4:10 Panel Remarks - Continued

4:10-4:50 Panel Discussion with Interlocutor

4:55 End

6:45 Cocktails - Lower West Oval Room, The Rotunda

7:30 Closing Banquet - The Dome Room, The Rotunda

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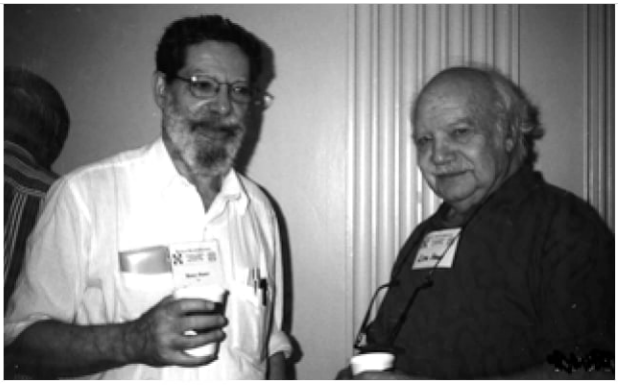

Prof. Henry Bauer (L) , Dept. of Chemistry, Virginia Polytechnic Institute & State University, an SSE member who has devoted much time to studying the dynamics of scientific controversies, especially the "Loch Ness Monster." (Yes, he is quite convinced the sighting reports are really of a large animal. He is friendly toward, but still a bit lukewarm about, the cold fusion evidence!) (R) Lee Edson, a freelance science journalist (one of the better, more open-minded ones.) *(Photo: EFM)*

At the SSE Banquet: SSE's Dr. Beverly Rubik of the Institute for Frontier Science in Oakland, California. She has published widely about new paradigms in biology, speaking this year on "The Unifying Concept of Information in Biology and Medicine." Dr. M. Srinivasan, formerly of the Bhabha Atomic Research Center in India (BARC). "Chino" is one of the pioneers in cold fusion investigations. *(Photo: EFM)*

Shortly after the SSE meeting, Volume 12, Number 2 (Summer 1998) of the *JSE* appeared, it managed to get the attention of at least one media outlet, CNN. This concerned the issue's lead report on UFO Report Physical Evidence from a 1997 Workshop: Here is the meeting abstract:

Physical Evidence Related to UFO Reports: The Proceedings of a Workshop Held at the Pocantico Conference Center, Tarrytown, New York, September 29 - October 4, 1997

DIRECTOR, P. A. STURROCK (Stanford University)

SCIENTIFIC STEERING COMMITTEE:
T. E. HOLZER, R. JAHN (Princeton), D. E. PRITCHARD (MIT), H. E. PUTHOFF, Y. TERZIAN (Cornell) AND C. R. TOLBERT

SCIENTIFIC REVIEW PANEL:
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INVESTIGATORS:
R. F. HAINES, I. VON LUDWIGER, M. RODEGHIER, J. F. SCHUESSLER, E. STRAND, M. D. SWORDS, J. F. VALLEE, AND J-J. VELASCO

MODERATORS:
D.E. PRITCHARD AND H. E. PUTHOFF

Abstract

The purpose of this four-day workshop was to review purported physical evidence associated with UFO reports, with a view to assessing whether the further acquisition and investigation of such evidence is likely to help solve the UFO problem, namely the determination of the cause or causes of these reports.

Seven UFO investigators presented a variety of physical evidence that they claimed was associated with UFO reports: photographic evidence; luminosity estimates; radar evidence; interference with automobile functioning; interference with aircraft equipment; apparent gravitational or inertial effects; ground traces; injuries to vegetation; physiological effects on witnesses; and analysis of debris. There was in addition a presentation of investigations into recurrent phenomena that occur in the Hessdalen Valley in Norway.

A review panel was composed of nine scientists of diverse expertise and interests. The panel offered comments and criticisms concerning the investigations that were presented, and also prepared a summary of their overall response, with the following key elements:

- Concerning the case material presented by the investigators, the panel concluded that a few reported incidents may have involved rare but significant phenomena such as electrical activity, but there was no convincing evidence pointing to unknown physical processes or to the involvement of extraterrestrial intelligence.
- The panel nevertheless concluded that it would be valuable to carefully evaluate UFO reports since, whenever there are unexplained observations, there is the possibility that scientists will learn something new by studying these observations.
- However, to be credible, such evaluations must take place with a spirit of objectivity and a willingness to evaluate rival hypotheses.
- The best prospect for achieving a meaningful evaluation of relevant hypotheses is likely to come from the examination of physical evidence.

The chances of a significant advance are considered to be greater now than at the time of the Colorado Project that led to the Condon Report thirty years ago, because of advances in scientific knowledge and technical capabilities, and in view of the example of a modest but effective UFO research project provided by the French space agency CNES.

Continued from page 31

UNEXPLAINED WEIGHT GAIN TRANSIENTS

Lewis Hollander, Redmond, Oregon

There have been two reports of unexplained transient weight gains. These transients are of the order of one to five seconds in duration end magnitude of 18 to 220 grams in sheep and 800 to 1000 grams in humans. An electronic scale with a response time faster than one second is required to observe these transients. Transients were first observed by the author during, experiments weighing sheep at the moment of death.[1] The scale had a sensitivity of one part in 20,000, a response time of 0.2 seconds and a resolution of 5 grams. No permanent weight change at death was noted. The transient weight gains were observed in half the animals tested. Sheep #3, for example, had a 54 gram gain with a pulse width of 6 seconds. Similar pulses of greater magnitude were observed in humans during meditation, but thus far the effect is unpredictable. During levitation experiments on humans, Hasted *et al.* reported that "four sharply peaked weight increase signals were recorded in otherwise quiet sessions," and that a second subject exhibited "two sudden 5 second weight increase signals of about one kg," [2] These transients may just be an artifact of the equipment used or they may be a hint that gravitational effects have a yet undefined role and need further investigation.

1. Hollander, L. E., "Transient Weight Gain in Sheep at the Moment of Death", Report #5, *Res. Ass.* Dec. 1981.

2. Hasted, J. B., Robertson, D. and Spenelli, E., *Research in Parapsychology*, 1983, Scarecrow Press, (1982) Editors Roll, Beloff and White pp. 105-106.

Editor's note: I questioned Hollander about the precautions taken in the measurements. His digital data acquisition system is superb. After years of work he has not been able to explain the transient weight gain anomalies away, nor has he been able to generate *by other means* unidirectional (positive-only weight gain) pulses on the scales he has used. Animal breathing or other motion does not explain these pulses, according to Hollander.

This is the kind of open question for open minds that is regularly offered up by this world-class organization, the Society for Scientific Exploration.

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Michael McKubre's (SRI) Summary During ICCF-7 Closing Remarks

Continuing ICCF-7 Coverage

Transcribed by Jed Rothwell

I am perfectly happy to stand behind the podium and appear to be a politician. In fact, I am not even too proud to ask for money for cold fusion – to demand money for cold fusion. I am going to present less of a precise scientific assessment and more a judgement of what I have heard this week. I see the field becoming polarized somewhat. If you imagine a spectrum from fundamental research on one hand to engineering development on the other, the history of cold fusion as I've been associated with it has been mostly concentrated in the middle. People have been attempting to make small demonstration objects, with the purpose of attracting the attention of large-scale engineering development. So heat experiments, in the attempt to produce meaningful levels of excess heat, have dominated [previous ICCF conferences]. Not so at this conference. I see a polarization between groups doing fundamental work – much of it materials related, and the break towards rapid engineering development, characterized by ENECO for example, CETI, Blacklight Power (who are not represented here).

In some senses this polarization is good. It is certainly good in that the two groups continue to attend the same conference, so that they can cross-fertilize each other...perhaps that's not a well chosen phrase. With respect to the materials aspect, I see some very, very good signs coming out of the cold fusion field. The Wednesday morning session, that I was fortunate enough to co-chair with Francesco Scaramuzzi, started with Celani and ended with De Ninno. It was perhaps the best-sustained session at a cold fusion conference that I have attended, and I have been to every conference and I have attended most of the sessions. I was very impressed at the sustained high level of reports: the logic, the reasoning, the structure of the experiments and their results. There was once the time when we, in designing and organizing these conferences, put the least interesting papers into the materials session. The people who talked about materials were really those people who were trying to do excess heat experiments but hadn't succeeded in getting any results. So they talked about materials. I've even done it myself. Now, the strength of the field is in the materials sessions. People have recognized that this is where the problems lie, and they are turning their attentions and intellects to solving the problems. For me this is a very strong step forwards. And in this context, I was very impressed—and have been for some time—with the strength of the Italian contribution to this field, and in this area, and it seems to me to be utterly appropriate that ICCF8 will be hosted in Italy.

With respect to the other polarity of this field, the engineering development, well...the first thing it indicates is there is money. There is optimism. And I hope it also indicates there is a demonstration object in clear sight. So this is a good thing.

In some senses this polarization is bad, or unfortunate. It means the materials issues have not been resolved, so we are forced to work on them. We have been working at this nine years. It has taken a while to recognize, I think—or to gain a consensus – that there is a significant materials induced irreproducibility in this system. And for me this is a personal affront, because I have been saying it year after year after year. Finally, the world has probably come to a separate view that this is in fact the case, and a great deal of effort is being put into it. But the problems are profound. The problems of palladium, the problems of the electrochemical interface, are truly, awesomely profound, and at the moment I do not see the resources directed to solve these problems in any realistically short time. So I come back to my first point: give money to cold fusion.

The work is focused on materials because we have not been able to scale our excess heat experiments. At least, those that have been able to scale it haven't announced that publicly, with perhaps one exception. And in this respect I direct you to the statement made by Mr. Matsui in the NHE presentation. The reason the NHE, NEDO and MITI have abandoned this effort, at least temporarily, is because the project was set up as a way to gain advantage in the engineering development of a cold fusion heat machine. The work that was done at the NHE—tremendous work—finally focused heavily on materials issues. But the fact is, as Mr. Matsui very accurately said, they were not able to obtain sustained, reproducible levels of excess heat sufficient to base an engineering development program. Therefore the project had failed and must be terminated.

I think the polarization is perhaps unfortunate in another regard: without fundamental knowledge to guide the engineering development, it is not clear to me that the demonstration object—the machine, the heat producing machine that will utilize this phenomenon—can be and will be made within the resource of funding and patience that are available to us, at the moment. But on the whole I am pleased with the balance, with the focus, with the attitude.

Something which I noticed at this conference for the first time is the significant involvement of people younger than me. This is absolutely crucial if the field is to survive. As our average age increases with each ICCF, as the rate of progress isn't as fast as it could be, we will just die before we understand this. Our critics will succeed not for any good reason but because we have lost the capacity to stand up at a microphone and speak. In this context, of bringing young people to the conference, I think Professor Takahashi a very strong thanks. Professor Dash is working with young people. I see a surprising and very pleasing representation of a young Canadian contingent. I had no idea Canadians even knew what cold fusion was. Having said that, I think there is still an opportunity to learn from the greybeards in this field. Two of the best papers for me at this conference were the papers presented by Ed Storms and Martin Fleischmann, who are not the youngest of us. They are saying things that we need to listen to. There is still a contribution to be made by the people who generated this field and defined it.

For me, the best heat report, and perhaps the best report at this conference, was that of Mitch Swartz. I have not been the greatest...that's not a good word...I have not had the highest hopes for the nickel - light water experimentation. I have not been able to perform the experiments myself, successfully, and I have always felt that the quality of the calorimetric observations in the nickel-light water studies has been less than the quality of the calorimetric observations in the palladium-deuterium system. This is obviously a prejudiced and biased view. But, Mitch Swartz presented a very clear piece of calorimetric evidence which is certainly going to cause me to reconsider my belief and my understanding of the nickel-light water system and its capacity to produce anomalous heat.

Another paper that I would like to mention, because it came as a surprise to me, both in the result and in the attitude, was that of Les Case, who had exposed deuterium to a standard pal-

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ladium on carbon catalyst and observed consistently excess heat. Now, in the history of this field, people that obtain such results didn't tell you what they had done. They hinted that they had done it, and they had the answer, and when you asked them what they had done, they said, "I cannot tell you"—because of some proprietary concerns or some dreams of a Nobel prize. This has been one of the most constipating factors in the development of cold fusion. And I was very impressed with what Dr. Case had done and the fact that he was willing to completely and openly speak of it, in order to solicit our input, and to work with us, in order to demonstrate. There is certainly the possibility of an error associated with those measurements: set it up and test it, let's work together and discuss the results.

There is a cohesive spirit in the cold fusion community. I didn't spend as much time as I probably should have in preparing these remarks because I regard every one of you as a friend and when you talk to your friends it doesn't matter what you say; people think that it sounds good. When you talk to your enemies it doesn't matter what you say; it's rubbish. One of the strengths of this community is the attitude of warmth and friendship which surrounds us. I have a great hope that we will succeed. I think if you were to design a project, a concept, the sole purpose of which was to bring people from several nations together to work, people from several disciplines together to work, and to listen and talk to each other, you couldn't design one better than cold fusion. It may be that Fleischmann knew this all along and has perpetrated this on us just for the purpose of an electrochemical—materials science—nuclear processes-man-on-the-moon project...

...The five minute poster briefings at this conference, were one of the surprises for me. I had not imagined that they could be as successful as they were... Graham Hill once said "If you can't explain your idea in five minutes, you don't understand it yourself." Given the language difficulties, and the cross-discipline nature of this field, that task becomes a little more difficult. But, I thought that everybody did a tremendous job in sticking to the times, sticking to the clarity of their thoughts, and I learned more in a sustained way during those five-minute sessions than I have in many weeks of conferences on other topics or on this topic for that matter—so much so that I am completely worn out. I've absorbed so much information that I am now fatigued...

Finally... (I mentioned this briefly on the boat, when we were all under the influence of the ocean), I think Fred Jaeger and the local organizing committee have done a tremendous job at organizing this conference. I don't know about Fred's motto: "The Best Ever," but the organization was the *best ever*. I am expecting that we will go on to ever better and better conferences. I think "The Best So Far" would hopefully be a more accurate description. So I would urge you all to give your support to Francesco Scaramuzzi, towards the organization and success of ICCF-8 in Europe, and go forth and multiply.

Thank you.

••More coverage of ICCF-7 continues on page 59••

Why not give *INFINITE ENERGY* as a Gift Subscription to a Friend or to your local library?

COMMENTS ABOUT:

Tadahiko Mizuno's book,
NUCLEAR TRANSMUTATION: THE REALITY OF COLD FUSION

by George Miley,
University of Illinois,
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100 NEL, 103 S. Goodwin,
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email: g-miley@uiuc.edu

This fascinating account by Prof. Tadahiko Mizuno of his personal experiences in cold fusion is "must" reading for researchers in the field and for all others who have an interest in it, either "pro" or "con." In the process of recounting his experiences and views, Dr. Mizuno provides an important glimpse into how research often evolves in practice and how the process can plunge into a chaotic maze in some cases like "cold fusion."

Dr. Mizuno has been involved in cold fusion research since its beginnings over nine years ago with the famous press conference held by Stanley Pons and Martin Fleischmann. Among his achievements were the first extensive reports of neutron measurements in Japan, pioneering work on loaded proton conductors, and key new studies of transmutation products. His book is not so much an account of these important achievements as it is an account of how he and colleagues approached and planned these experiments, about the politics involved in reporting results and obtaining support, about the response of colleagues, critics, news reporters, and others. His experiences mirror many of those encountered by others working in the field. Perhaps, as he states, "…science has progressed to the present day largely by trial and error." This is certainly counter to the idealistic view of the delicate scientific process, but Mizuno's account certainly provides an interesting window on the working environment of a very productive modern day scientist struggling in the emotional and chaotic field of cold fusion.

Dr. Mizuno points out that a scientist's attitude in research is essential for success. Ideally, "…he (the scientist) must be sincerely interested and enthusiastic—(while) the university's job is to ensure an environment in which scientists can concentrate on their work…(to) return the benefits from their research to society." Unfortunately, it is difficult to approach this ideal, and the difficulty is rapidly compounded in a highly visible area like cold fusion where pressures mount and human frailty and egos take over. Thus, Dr. Mizuno finds colleagues who are not personally doing research on cold fusion, but who still call news conferences to proclaim their views. Other individuals engage in openly rude and insulting behavior as part of their automatic "questioning" of anyone daring to work in the field. Dr. Mizuno at one point asks the rhetorical question, "why?"—an unan-

Miley continues on page 52

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The March for Peaceful Energy: 10/24/98

From: PlantSeedK@aol.com

To Whom it May Concern:

October 24, 1998 will mark the date for an international movement. On this date will be "The March for Peaceful Energy" on the mall in Washington, DC in front of the capitol building. This march will be the biggest environmental event ever, making a statement to the public that we need to start to put an end to the use of fossil fuels and convert to alternative energy sources. Not only will this event help to clean up our environment, but it will put an end to many of the wars going on around the world over resources and profit. We are expecting at least one million people to attend this event. We are trying to reach this quota by having a panel of major speakers as well as popular music groups.

Current speakers/musicians to appear are: Scott Sklar, Brian O'Leary, 17 year old Daniel who converted a Volvo from a gasoline engine to a hydrogen engine, Eugene Mallove, Jeane Manning, Chief Arvol Looking Horse, Hazel Henderson, Helen Caldicott, Roy McAlister, Hal Fox, Bonnie Reiss, Gaylord Nelson, Peace Pilgrim, the Robert Charles Blues Band, Project Exodus, the David Marks Band and Sharon Perez-Abreu. We are currently speaking with other major rock bands and political figures, but because they have not been officially confirmed I will not be disclosing them in this letter.

We were hoping to have Atal Behari Vajpayee, the Prime Minister of India, be a key speaker because has called for a worldwide change to improve our environment. Due to current events we are putting this invitation on hold.

We need more individuals and organizations to help us in many areas. We need more information sent out (networking), donations, housing arrangements, and more speakers and entertainers. Also if anyone lives in the Washington area we would appreciate more people coming to the meetings of DC Solar—the organization sponsoring this event. If anyone has any leads for major speakers or entertainers, please contact me. If anyone would like to receive a phone call, please leave your number and the best times to call.

If you have concerns about the credibility of this project, please contact Kathy at the American Hydrogen Society (602) 827-7915.

We would like to have multiple marches going on in other areas at the same time. We are especially interested in having one take place in London. If anyone or any organization would like to chair a simultaneous event, please contact me. If we raise enough funding we will be able to help you financially.

If anyone would like to send a donation, please make checks payable to DC Solar at: DC Solar c/o University of Maryland College Park, Stamp Student Union Box 73, College Park, MD 20742 USA. We are asking all renewable energy companies to donate $100.00 to the march. They are great in number and if we all cooperate we can make this happen in a big way. Any companies interested in being a title sponsor should contact DC Solar for details. If we have a surplus of money after paying for the event, all proceeds will go to the purchasing of a renewable energy generator (or generators depending on the budget) for third world nations.

Subscribe to the march forum to receive progress updates:

http:/ / www.indax.com/ peace

Please contact me with suggestions, ideas, forms of support or leads for major speakers or entertainers.

Regards,
Richard Lasken
President of DC Solar

Feel free to forward this message to any potentially interested parties.

Editor's Note: **Despite some misgivings about the content of this Peaceful Energy March in Washington, I support it and have agreed to be a speaker so that the message of Cold Fusion and New Energy will be heard by devotees of conventional renewable energy and even by those few who wrongly believe that profit is "evil." Let there be *no mistake*, I am not going to Washington to seek government funding for Cold Fusion and New Energy! Rather, I will advocate the abolition of the U.S. Department of Energy and an investigation into its wanton criminal activity against cold fusion—its abandonment of *science* in favor of politics.**

— *Gene Mallove*

Another Cold Fusion Meeting in Italy

Information received from:
William J. M. F. Collis, collis@netcity.it

The program of the Frascati Meeting, Workshop on "New Energy from Hydrogen." About 60 people attended.

Thursday, May 28

9:30 Welcome (R. Andreani)
9:45 About the origins of this Workshop (A. Airaghi, G. Preparata)
10:00 State of the art of NHE after ICCF7 (F. Scaramuzzi)
11:00 Coffee Break
11:30 Review of excess heat detection in electrolysis (M. McKubre)
12:10 Review of transmutations during electrochemical processes (G. Miley)
12:50 Clear-cut evidence of nuclear processes in NHE (D. Gozzi)
13:30 Lunch
15.00 The experimental activity at ENEA Frascati (A. De Ninno)
15:40 The research program at CEA/Grenoble (J.P. Biberian)
16:20 An experiment on gas loading (U. Mastromatteo)
16:50 Helium detection in gas loading experiments (F. Iazzi)
17:20 End of section

Friday, May 29

9:00 The experiments at LEDA (E. Del Giudice)
9:40 Hydrogen dynamics in a metal lat tice (V. Violante)
10:20 The experimental activity at INFN /Frascati (F. Celani)
11:00 The experimental activity at CNR /Padova (G. Mengoli)
11:40 Coffee break
12:20 General talk: "Prospects of ther monuclear fusion research" (F. DeMarco)
13:00 Lunch
14:40 Round table: "Prospects of research on NHE" (A. Airaghi, R. Andreani, F. De Marco. G. Preparata, G. Ros tagni, ...)
16:00 End of workshop

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Former EXXON Research Director Joins CETI

CETI Adds Director of Technology

It is Big News when a former senior technical person from a large oil company joins a cold fusion company. Clean Energy Technologies, Inc. of Sarasota, Florida announced that Dr. Lou Furlong, former Director of Research for Exxon Research and Engineering Company for 30 years in Florham Park, NJ has been hired as Director of Technology. According to the press release from CETI, at Exxon, "Dr. Furlong negotiated agreements to commercialize technologies including battery production, fertilizer, tungsten carbide synthesis, catalysts, lasers, and tomography-3D high resolution imaging. Dr. Furlong has experience in management, budgeting, planning and administration. He worked on Exxon projects such as Synthetic Fuels Research and Coal Liquification. Dr. Furlong will interface with the scientists and engineers in CETI's Sarasota laboratory to focus on research and development of CETI technology and guiding that research toward commercialization with CETI strategic partners."

Further staffing news from CETI: "William F. Flynn has been named the Chief Financial Officer of Clean Energy Technologies, Inc. Mr. Flynn successfully closed the Private Placement Memorandum for CETI in early 1998 and also serves on the Board of Directors for CETI. Mr. Flynn has a strong background in investment banking serving as a key executive with Merrill Lynch, Dean Witter, Arthur Anderson and Greenwich Capital Markets. In addition to his work at CETI, Flynn currently manages his own firm, investing private equity and doing merchant banking transactions."

CETI has now organized itself into three business divisions, according to its WWW site:

CETIThermoTech^{tm}

Leveraging our knowledge and technical expertise gained from recent discoveries in low energy nuclear physics has led to the emergence of new methods of producing thermal energy at efficiencies well beyond the parameters of other available methods. Further development will enable CETI to offer technologies for a wide-range of thermal energy applications. Development efforts have been underway on a super efficient water heater that will provide the basis for a variety of new products. Second generation laboratory systems have demonstrated economic feasibility of CETI's technology applied to high temperature energy production systems.

CETIRadTech^{tm}

Radioactive waste deactivation technologies have been developed utilizing our research in low energy nuclear reactions to transmute radioactive materials such as depleted uranium into safer, non-radioactive isotopes via an electro-chemical patented process. Ongoing engineering development is intended to deliver a commercially viable system for the conversion of hazardous elements as an alternative to long term storage of high level radioactive wastes.

CETIFiberTech^{tm}

This division focuses on superior technologies used for separating quantities of liquids and gases at the molecular level. CETI's biodegradable hollow fiber technology has demonstrated the ability to efficiently function not only as a molecular sieve but also as a delivery vehicle for water soluble compounds. The scope of technology development includes applications for a variety of liquid and gas separations and enrichments, controlled chemical delivery products, oil spill and colloidal suspension barrier interfaces, and dewatering applications. CETI fiber technology holds potential for generating early revenue streams since much of the research and development phase is completed for several applications. CETI currently has an inventory of several million linear feet of hollow core fiber and is negotiating with strategic partners for commercialization and market introduction of CETI hollow core fiber technology.

The International Association for New Science, the Academy for New Energy, and the Institute for Natural Healing — End Operations

Last April, we were very disappointed to learn of the demise (due to financial problems) of a tri-partite organization that had very lofty goals. The non-profit Colorado-based IANS (International Association for New Science), under which the Academy for New Energy (ANE) and the Institute for Natural Healing (INH) existed, has gone out of business. In the last days of the ANE, we had tried to help that group by providing *Infinite Energy* Magazine (at cost) as a replacement for the ANE *Newsletter*. It was this editor's great privilege to have spoken at two of the last ANE meetings in Denver in 1996 and 1997 (see meeting reports in *IE* #7 and in *IE* #13/14). I learned much from attending those meetings, and *Infinite Energy* gained new life afterwards.

Several paragraphs from the April 1, 1998 IANS announcement:

Friends and Supporters of IANS, ANE, and INH—

IANS has experienced many highs and lows over its nine year history. In that time, we have produced a dozen major conferences and over 125 seminars, providing a forum for the presentation of new ideas and theories in the fields of New Energy, Natural Healing, and New Science.

However, despite our repeated efforts, there has been insufficient financial and volunteer support available to sustain this level of activity. We must therefore announce, with great sadness, *the closing of IANS, ANE, and INH as of April, 1998.* Spirit has been guiding us in many of our organizational decisions, including this one, which we are told is in our best interest at this time.

We will not be able to produce a conference this year, as we had intended. Although we will be producing one final newsletter, all of our other services will be discontinued, including the production of future conferences.

IANS has been a catalyst for many new science research projects and affiliations, and has served as an inspiration for us all. We have planted many seeds—it is now time to utilize the knowledge that has been gained and to grow with it.

If you need to communicate about a past order or about any other IANS business, please write to us at the following new address *P.O. Box 8727, Ft. Collins, Colorado 80526.* Our phone and fax lines, websites, and email address will be discontinued shortly...

For those of you who have either recently joined our organization or renewed your membership, we apologize for this closure. Our final newsletter will be sent to our members in April, 1998, and the remaining funds will be just enough to allow us to close down gracefully. If you feel you need to have your money refunded, please write to us and we will do our best to grant your wish. If you prefer to turn it into a contribution to an organization that has served for many years as an inspiration to us all, then we gratefully thank you.

It may be possible, at a later date, to pull IANS out of its current state of hibernation, if

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enough dedicated people appear with sufficient energy and motivation to come forward. Perhaps this letter will serve as an inspiration towards that goal.

From all of us at IANS/ANE/INH, we wish you well in your endeavors and hope that we have helped to light the path for your future journeys.

Sincerely,
Maury Albertson, Ph.D.
Jennet Grover
N-Polly
Joanne Fallert

"Dedicated to research and education for the benefit of our planet and its inhabitants"

Joe Champion Returns to Arizona Jail

The controversial and always hyperbolic Joe Champion, a clever and multi-talented technical person in theory and experiment, who has promoted methods for making precious metals at low energy (allegedly in commercial quantity), has returned to serve a lengthy jail sentence in Arizona—reportedly several more years.

The immediate cause of Champion's re-jailing was, according to informed sources, a violation of his parole agreement. To this date, and despite many attempts by others (including open-minded metals processing companies) to generate significant quantities of precious metals using his recommended methods, there exists no *firm* evidence that commercial quantities of precious metals have been generated. Joe Champion would say that there *is* such evidence, but we have not seen it in our inquiries.

It is nonetheless quite possible—even probable, in our view—that low but significant levels of precious metals have emerged in *some* of his recommended experiments. We refer, in particular, to experiments performed by the group at Texas A&M University in the early 1990s under the direction of Distinguished Professor of Chemistry John O'M. Bockris. Of course, in many "mainstream" cold fusion experiments today in Japan and in the US, the low-energy transmutation of elements has been observed regularly, so there is more than sufficient reason to suspect that Champion's ideas may have had partial validity.

Prof. Barry Merriman of UCLA, who spent considerable personal effort trying to get to the bottom of Joe Champion's claims, posted this concise summary on the Vortex forum on May 6, 1998:

"All I have to add is that, based on my close relationship with Joe the past two years, I would say that both legally and morally Joe deserves what he got. He's a very likable fellow, at a casual level, but he definitely violated his parole and also ripped off many people by selling them unworkable transmutation schemes. And he is what ordinary people would call a pathological liar, although technically he mainly exaggerates things to ridiculous extremes. Two typical cases of interest to Vortex readers illustrating this would be:

1) Two years ago, JC announced here that he would have an on-site demo in August of his industrial transmutation process, and invited 12 scientists to attend and verify. This was the point at which I first got involved, in fact. Subsequent investigation showed that the owners of the site of Joe's intended demo had no idea of his plans, and also no further interest in Joe's processes. The reality was that, at the time Joe announced his on site demo, Joe was fishing around for a site and someone to construct all the equipment, and it was just a pie-in-the-sky dream that it would ever take place at all—the processes in question were not even working, much less at a large scale. The discrepancy between what Joe publicly said was a major planned (he had a date, site, etc) demo event, and reality, was vast.

(2) Sometime later, also announced here on Vortex, there was the great "Hafnium Event," in which Joe's processes, under the execution of a third party, were producing a grey metal that turned out to be Hafnium, in "gram"(!) quantities from kilogram quantities of ingredients. Privately Joe told me it was in fact 100's of gram quantities. The reality was that the process was indeed producing 100's of grams of grey material, most of which was salts. The mass-spec done at UCLA showed it had hafnium in it, in minute amounts, and analytical chemical tests done at a reputable commercial lab put the level of Hafnium (as well as Zr, Gold, Silver and Platinum) at less than 10 ppm. Also, I have subsequently interviewed the other parties that had tested the material prior to Joe's public announcements here, and none of them put the Hf content at beyond a few ppm (the tests I had done were by far the most reliable). Thus, Joe had no reason to think there were more than ppm levels, which could easily have been contamination, given the setup that was producing the material. So, given that Hf was present at the level of a few ppm, we again have a case were Joe was off by a factor of 100,000 in his statements.

I could easily give another 5 or so first hand stories like the above, and probably 100 second hand stories, but the above make the point with stuff that was actually published here on Vortex. Joe is a pathological exaggerator—that is fact, no *ad hominem*.

As for the technical question of whether Joe really does have processes that can turn lead into gold, all I can say is that after numerous repeated attempts, he was never able to transmit to me a repeatable experiment. It remains a mystery as to how his processes have been able to convince a few certain credible others of the reality of the effect—I still plan to get to the bottom of that, and really Joe is not needed to answer this question....he doesn't know the answer himself, I'm convinced, nor does he have the ability to demonstrate a repeatable process that might shed light on the answer, nor can anything he says be trusted.

But, for the record, my own personal experience so far suggests that Joe has absolutely no ability to make gold, but does have the ability to muddy the waters enough to keep the dream alive for himself and others."

-End of Merriman Posting-

At this time it may be appropriate to recall the wisdom of Francis Bacon in 1620 about "alchymists":

"But if any one should condescend to consider such sciences as are deemed rather curious than sound, and take a full view of the operations of the alchymists or magi, he will perhaps hesitate whether he ought rather to laugh or to weep. For the alchymist cherishes eternal hope, and when his labours succeed not, accuses his own mistakes, deeming, in his self-accusation, that he has not properly understood the words of art, or of his authors; upon which he listens to tradition and vague whispers, or imagines there is some slight unsteadiness in the minute details of his practice, and then has recourse to an endless repetition of experiments: and, in the meantime, when in his casual experiments he falls upon something in appearance new, or of some degree of utility, he consoles himself with such an earnest, and ostentatiously publishes them, keeping up his hope of the final result. Nor can it be denied that the alchymists have made several discoveries, and presented mankind with useful inventions. But we may well apply to them the fable of the old man, who bequeathed to his sons some gold buried in his garden, pretending not to know the exact spot, whereupon they worked diligently in digging the vineyard, and though they found no gold, the vintage was rendered more abundant by their labour.

—Francis Bacon, Novum Organum ("A New Instrument"), 1620

New Energy Times Archive

Minato Magnetic Motor to be Demonstrated in Mexico City

In late June we received the following press release from the Tri-Cosmos Development Company in California:

"The Magnetic Rotating Apparatus"

Inventor Kohei Minato, the Thomas Edison of the New Millennium, has acquired more than 50 patents and intellectual property rights from all over the world for the energy creating "Magnetic Rotating Apparatus." Mr. Minato's generating device utilizes the magnetic force of repulsion to create and emerge clean safe energy.

The "Magnetic Rotating Apparatus" employs a number of stationary neodymium magnets arranged at regular intervals on the peripheral portion of a rotor. The polarity of each magnet, which is located radially outward from the rotor, is identical. The machine is started with an electromagnetic stator. When activated, the magnetic fields repel, creating rotation of the rotor. As the rotations per minute (rpm's) increase, the electrical consumption to the electromagnetic stator decreases. This phenomenon is in direct conflict with accepted laws of physics and is achieved through the repelling magnetic fields. It operates without heat, noise, or pollution of any kind. It can be produced in size[s] from ultra small to very large.

One of the prototypes available for viewing operates with an input of 34 watts of electricity and outputs a maximum of 500 watts. "Magnetic Rotating Apparatus" applications currently under development include usage from [in] cell phones and laptop computers to automobiles and giant power stations."

For more information, contact:
Tri-Cosmos Development Company
1888 Century park East. 19th Floor
Century City, CA 90067
Telephone: 310-284-3250
Fax: 310-284-3260
E-mail: tricodev@aol.com

—End of Press Release—

We understand through our associate Hal Fox that there will be demonstrations of a Minato Motor in Mexico City, Mexico on July 8, 9, and 10, 1998. We have no concrete information about the validity of Minato's claims, but it will be interesting to learn about what transpires in Mexico. The meeting in Mexico is said to be hosted by Grupo Bufete Industrial, "Mexico's largest engineering construction company." Attendance at the demonstration is by invitation only. Minato is said to be well-funded by Japanese investors.

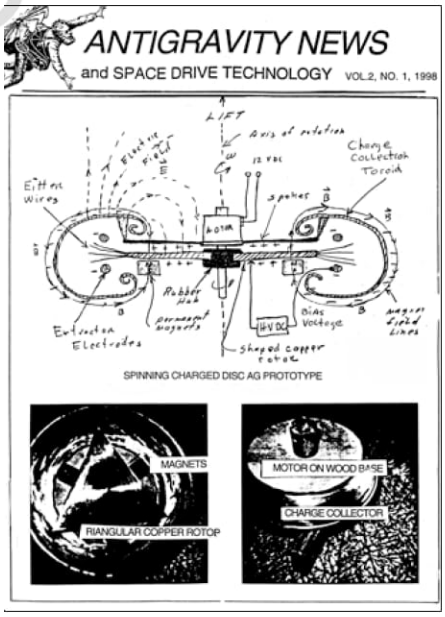
Infinite Energy had a brief discussion of Minato's motor and his patent in issue #7, pages 8-9.

"ANTIGRAVITY NEWS and SPACE DRIVE TECHNOLOGY"

Magazine Debuts

It is always a joy to see a journal of heretical physics and technology launch into uncharted waters. We are pleased to see that the latest such journal, *ANTIGRAVITY NEWS and SPACE DRIVE TECHNOLOGY,* has now reached "magazine maturity" with Issue #2 in its second year (Vol. 2, 1998).

AGN is the labor-of-love of Editor-in-Chief, engineer James E. Cox of Marietta, Georgia (770-218-9693). Jim has long been interested in "reactionless space drives," and the varieties of "antigravity" claims. There are many more of these claimed devices and effects than one would imagine! In the previous issue of AGN (Vol. 2, No.1), Cox lists 66 of these in a large fold-out sheet, ranked according to "lift," whether there is a demo in existence (or ever was), whether there are witnesses to its performance, whether it has appeared in a peer-reviewed journal, etc.



Helping Cox with this eclectic bimonthly publication is Domestic Editor, engineer Ron Kita (215-345-0461), who has also long had a fascination with these devices. The prototypical such gadget was the "Dean Drive" of Norman L. Dean, which was given wide currency when John Campbell of *Analog* Science Fact and Fiction editorialized about it in his June 1960 issue, "The Space Drive Problem." The current 64-page issue of *AGN* is devoted entirely to the Dean System Space Drive.

At the moment *AGN* is not a desktop computer publication—being pasted together and copied roughly from a collection of very intriguing materials. But of course it is content that really counts, not appearance. It is a very noble effort. If you are interested in such matters you should subscribe to *AGN*: (Mailing address: PO Box 655, Marietta, GA 30061). The black and white publication is $36/yr(USA); $42/year (Mexico/Canada); and $48/yr for other countries. We wrote up the controversy surrounding Eugene Podkletnov (from Finland) and NASA with their high temperature superconductor gravity shield developments (*IE* #9, pp. 49-50, "Table Top Anti-Gravity?" by Chris Tinsley), but *AGN* is able to devote much more space to this sort of topic.

The flavor of the orientation of the magazine comes through in a brief editorial by Jim Cox, "Fear of Antigravity" (Vol. 2, Issue #1): "Having put out a newsletter on the subject of antigravity for half a year now, I am coming to understand the 'sociology of antigravity.' The most striking aspect of the subject is the fear that it induces in mainstream science, academia, the various governmental institutions and the average citizen. The fear takes numerous forms and has many aspects to it. *Analog* editor John Campbell spoke of the "Space Drive Problem" in the June, 1960 issue; namely, the emotional reaction to seeing something working that destroys your worldview of the universe. It upsets the physics apple cart. Industries are scared as to how it will affect them (overnight obsolescence). The military is afraid potential enemies will get the technology first. The average man wonders what is wrong with the old car he has in the garage and sees no reason to change--to a more expensive gravity car model that will require re-training (maybe even a pilot's license)." We at *Infinite Energy* will be covering "anti-gravity" too, though not as extensively as *AGN*, so stay tuned.

New Energy Times Archive

The Death of Dr. Yull Brown, Science Pioneer

The Planetary Association for Clean Energy, Inc. (PACE) confirms the sad news of the death of Prof. Yull Brown, the original inventor and advocate of the unusual gaseous fuel known as "Brown's Gas." This gas—on its face a stochiometric mixture of hydrogen and oxygen obtained in AC electrolysis of water—has unquestioned practical applications in welding and metal cutting. However, it has not been widely used (yet) for this purpose. The gas apparently has other properties, more controversial to be sure, including the possibility that it is a more efficient generator of forms of hydrogen (including mono-atomic hydrogen) and oxygen, that it can weld metals to ceramics, and that it can denature radioactive elements.

Dr. Brown passed away, Friday, May 22, 1998, at 21:20 p.m. local time at the Westmead Hospital in Auburn (near Sydney) Australia. "He died with his loved ones and closest friends by his bedside," according to the announcement.

The Planetary Association for Clean Energy, Inc. will be sending *IE* more materials on Dr. Brown's work in his later days, and we will have a much longer report on Browns' life-long contributions to New Energy in a future issue. But for now, as a fitting tribute to Yull Brown, with permission from PACE we reprint in this issue of *Infinite Energy* the following accurate description of events surrounding his demonstration to U.S. DOE officials his claim that Brown's gas could be used to remediate nuclear waste. Given the other results on electrochemical nuclear waste remediation now emerging, we are inclined to believe that the gas may have this ability, but we shall see what future tests will reveal.

Further information on Brown's Gas is immediately available from Dr. Andrew Michrowski of The Planetary Association for Clean Energy, Inc., 100 Bronson Avenue, Suite 1001, Ottawa, Ontario K1R 6G8 CANADA (613-236-6265, Fax: 613-235-5876).

Transmutation of Radioactive Materials with Yull Brown's Gas
96% Radioactivity Reduction
By Daniel Haley, Former Chairman
Joint Commission on Energy, New York State Legislature
Reprinted from *Planetary Association for Clean Energy* Vol. 6, No. 4.

On August 6, 1992, a team of five observers led by officials from the San Francisco field office of the Department of Energy (DOE) visited Southwest Concrete Products in Ontario, California for a demonstration of the effects of Brown's Gas on radioactive materials. This visit resulted from a request to DOE by former Congressman Berkeley Bedell.

Months later, the DOE field office summarized their conclusions on the experiment they witnessed. Admitting lower radiation levels were achieved, they attributed the phenomenon to two causes: 1)"dispersal within the molten matrix" - encapsulation and 2)"different geometric configurations" - different shape.

The author, Alex Dong, director of the Environmental Research and Waste Management Division, declared, "nothing in this demonstration, before or after, provided quantitative evidence that radioactive materials had been destroyed," and that "this office does not intend to pursue the subject further."

One of the five observers was upset by the handling of the low-level radioactive material (Cobalt 60) during the experiment and, upon leaving, called the Los Angeles office of the California Department of Health Services, which sent an inspector the same day to inspect the premises. Southwest Concrete Products put on the same demonstration for the Health Services inspector, whose office sent a letter a few days later on what had been observed.

Since neither of these letters confirmed the destruction of radioactive materials, early in 1993, I called Russ Roberts, whose name was on the DOE letter. He returned my call, joined by Gary Callahan, who seemed to be the senior of the two and who stated that he had organized the visit to see the Brown Gas demonstration.

Both Roberts and Callahan stated that they were sure that radioactivity had been released into the environment and that they had stood far back from the experiment behind something in an attempt to shield themselves. Since their letter had granted that the Geiger counter radioactivity reading had been reduced, I asked them by how much and they said it had been reduced by an order of 3 or 4; I pressed them for specific numbers and they told me that the initial reading was 1000 counts and that after the experiment, the reading was 40. They seriously defended, against my skepticism, their concept that by changing the shape of the radioactive material, Brown could have lowered its Geiger counter reading. In addition, as stated in their letter, they said that radioactivity had been encapsulated within the material.

After talking with them, I called Bob Dzajkich at Southwest Concrete Products. He told me that he showed exactly the same experiment that was demonstrated to the DOE group to the Health Services inspector, who before and after the experiment took Geiger counter readings around the room, finding that, "essentially no Co_{60} was dispersed into the environment—that is, heating and test chamber and immediate area around the test chambers were contamination free." This statement demolished the DOE people's verbal assertion that radioactivity had been released into the ambient air—one wondered why they didn't take such readings instead of relying on their assumptions.

Bob Dzajkich further told me that when he read the DOE letter asserting encapsulation, he decided to see if they were right. He took Geiger counter readings of the material left from the experiment, ground it to dust and then took Geiger counter readings of the dust. He found that the readings had not changed at all.

Thus, radioactivity did not go into the air, since the Health Services inspector measured it before and after the experiment. In addition, as determined by Bob Dzajkich, radioactivity was not encapsulated inside the material, or "matrix," as the DOE called it.

Thus, their theories of encapsulation and dispersal into the ambient air do not hold water. This leaves only the DOE notion that changing the shape of a radioactive substance could reduce its radioactivity to support their conclusion that, "Nothing in this demonstration, before or after, provided quantitative evidence that radioactive material had been destroyed." Of course, this is a statement of the obvious: nobody said that material would be destroyed, but that radioactivity would be destroyed; that they refused to state.

My impression after speaking to them for an hour on the phone was that these DOE fellows must have decided that if they attempted to report favorably on the results of Brown's experiment—something they "knew" to be impossible—that they would be ridiculed. Even then, unlike the Department of Health Services, it took them nearly three months to decide

Brown continues on page 42

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Words to Eat...

A Flim-Flam Man with Foot in Mouth—is an apt description of magician James Randi, at least on the matter of cold fusion. I can't say I have been impressed with his alleged "debunkings" of other heretical scientific phenomena either, but for this space let's focus on cold fusion—something we know quite a bit about. After all, we have studied the scientific literature, done experiments, made measurements, checked other people's devices, and traveled to cold fusion conferences in the U.S., Japan, Italy, Canada, and Monaco. Funny thing, we've never seen the Amazing Randi at any of these. We suppose he may be using remote viewing or ESP to formulate his rather harsh statements against cold fusion.

Just listen to what this alleged "genius" (the recipient of a MacArthur Foundation "Genius Award") said about cold fusion in 1994:

> "Why are the people of every culture so anxiously embracing claptrap that should have been left behind...? Part of the reason is to be found in the uncritical acceptance and promotion of these notions by the media, prominent personalities, and government agencies... **The "cold fusion" farce should have been tossed onto the trash heap long ago, but justifiable fear of legal actions by offended supporters has stifled opponents...** At the risk of being unbearably realistic, I must tell you that Elvis Presley is really dead, the sky is not falling, perpetual motion is a chimera, **cold fusion is a dead duck,** the earth is not flat, and the fault lies not in our stars, but in ourselves."
>
> James Randi,
> *American Physical Society News*,
> June 1994

We suspect that the genial but highly misinformed Randi gets his information about cold fusion from conventional sources, such as the weekly PR sheets by Dr. Robert Park of the American Physical Society (see *IE* #19, "Words to Eat," p. 52). Park is another person who believes that complex scientific issues can be answered with "argument from authority," e.g. some quickie, *allegedly* null cold fusion experiments by supposedly "good" laboratories such as at CalTech and at MIT can be used to devalue the much more extended and careful work

James "The Amazing" Randii, conjurer, writer and lecturer. *Photo: ©Enrico Ferorelli.* .

by hundreds of other scientists around the globe.

Randi has now gone even further against cold fusion—putting his foot so firmly in his mouth that we doubt that this conjurer will ever be able to extract it, no matter how tricky he gets. He has announced his 1997 "Pigasus Awards," mocking science reporter Dr. Michael Guillen of ABC television for covering cold fusion and low-energy transmutation (media work reported in previously issues of *IE*). This is the press release, that "The James Randi Educational Foundation" sent at our request, after we had seen these "awards" reported in *Skeptical Inquirer*:

Announcing the Official 1997
Pigasus Awards
from the
James Randi Educational Foundation.

On April 1st, we awarded the coveted Pigasus awards in four categories, for accomplishments in the year previous. The awards are of course announced via telepathy, the winners are allowed to predict their winning, and the Flying Pig trophies are sent via psychokinesis. We send; if they don't receive, that's probably due to their lack of ability.

This year, 1998, the prizes went to:

Category #1, to the scientist who said or did the silliest thing related to the supernatural, paranormal, or occult, goes to Dr. Michael Guillen of ABC-TV News. The science editor of ABC-TV's "Good Morning America" since 1988, Dr. Guillen has supported all manner of questionable "New Age" notions, usually by featuring endorsements by celebrities. Dr. Guillen holds Ph.D. degrees in physics, mathematics, and astronomy, and should know better. ABC-TV refers to him as, "a leader in this nation's campaign to eliminate science and math illiteracy." Judging from his indiscriminate promotion of pseudoscience and quackery, we don't think so. (See "Media" Award, below.)

Category #2, to the funding organization that supported the most useless study of a supernatural, paranormal or occult claim, goes to the National Institutes of Health, whose budget for their Office of Alternative Healing began as two million dollars, and now amounts to twenty million. This money, originally marked to do "basic research" on alternative healing claims such as homeopathy, acupuncture, and chiropractic, has been dribbled away on peripheral claims of individual quack advocates. In our thinking, "basic research" should address such questions as, "Does chiropractic work?" rather than, "How much pressure is exerted on the spinal column by the thumbs of the chiropractor?" As we've said before, an apt definition of "the spinal column" is: "It supports the head, the neck, and the chiropractor."

Category #1, to the media outlet that reported as fact the most outrageous supernatural, paranormal or occult claim, the prize goes to ABC-TV News, for **their unquestioning and enthusiastic endorsement of "cold fusion,"** ESP, psychokinesis, astrology, "magnetic therapy," and all sorts of junk science and highly questionable "alternative healing" modalities.

Category #4, to the "psychic" performer who fooled the greatest number of people with the least talent, is given this year to all the psychics, astrologers, fortune tellers, spiritualists, and palm readers who, though they were consulted a matter of hours before her death, all failed to see any danger for Princess Di. These were the best of the best, highly paid and respected by Di and her friends. So much for professional help.

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The James Randi Educational Foundation
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Let's set the record straight. Dr. Guillen did not "endorse" cold fusion, and he was certainly not "unquestioning" in his investigation of the Patterson Power Cell for "Good Morning America" and "Nightline." On the other hand, that is precisely how we would describe Randi's

New Energy Times Archive

endorsement of anti-cold fusion bigotry —unquestioning.

Long before the 1997 Pigasus awards were announced we learned that Randi had tried to persuade Arthur C. Clarke to change his positive viewpoint on cold fusion. Randi apparently threatened to fly (or perhaps teleport himself?) to Sri Lanka to bring about a miraculous conversion of Clarke against cold fusion (see Clarke's position, as given by his recent essay in *Science*, reported in this issue of *IE*, page 6). Upon hearing of this plan, my colleague Jed Rothwell sent this informative and good-natured letter to Randi:

October 30, 1997

Dear Mr. Randi,

Arthur Clarke tells me you have threatened to come and set him straight on cold fusion, but you fear it might end in a fistfight. That wouldn't be fair! You are mismatched. With boxing gloves or sabers, you will win. Settle your differences with a ping-pong match and Arthur will beat your pants off. I think there is a better way. Instead of confronting Arthur, why don't you go a few rounds with the experimental data? Here is a 1994 peer-reviewed paper from the *Journal of Electroanalytical Chemistry*. Read it, and report back to me if you find any errors. Based on the work described here, the autoradiographs, the tritium experiments at Los Alamos and other nuclear evidence, EPRI came to the following conclusions:

The excess heat generated in electrochemical cells with palladium cathodes and heavy water electrolyte appears to be far too large to result from chemical or metallurgical transformation. The evidence implies that the heat source is a nuclear reaction of some as yet undetermined nature.

BACKGROUND: *Since first announced in 1989 by Fleischmann, Pons, and Hawkins, "cold fusion" has been the subject of widespread interest and intense controversy. Palladium (Pd) cathodes electrochemically charged with deuterium (D) to unusually high D/Pd ratios exhibit episodes of heat in excess of measured electrical inputs. Although nuclear reaction products commensurate with the excess heat have not yet been observed, small but definite evidence of nuclear reactions have been detected at levels some 40 orders of magnitude greater than predicted by conventional nuclear theory.*

EPRI PERSPECTIVE: *This work confirms the claims of Fleischmann, Pons, and Hawkins of the production of excess heat in deuterium-loaded palladium cathodes at levels too large for chemical transformation. However, the phenomena were obtained in only about half the cells. From the conditions of loading, initiation time, and current density on the successful observations of excess heat, it is understood why the phenomena are so difficult to attain.*

—Development of Advanced Concepts for Nuclear Processes in Deuterated Metals, EPRI TR-104195, Research Project 3170-01, Final Report, August 1994, 128 pages, plus 342 pages on microfiche.

EPRI is the world's largest private energy research organization. The scientists at Los Alamos, who observe tritium production in the experiments now underway are among the world's leading experts in tritium detection. Do you know something these people do not know? Can you explain those 40 orders of magnitude? If so, please do not hide your light under a bushel. Please explain to them and to me where, how and why they are mistaken. You will save us all a great deal of trouble.

Sincerely,
Jed Rothwell

Needless to say, no response was ever received from Randi. No doubt he was occupied consulting a crystal ball about his next move against cold fusion and other "pseudoscience," which turned out to be the despicable "Pigasus" awards. These awards attack science and technology that will liberate the world from fossil fuel tyranny and send faulty "geniuses" such as Randi back to their caves. Yes, it would take a mighty white rabbit pulled from a hat to kill off cold fusion. We have proof that Mother Nature is capable of this extraordinary phenomenon, and as the saying goes "You can't fool Mother Nature!"—not even if you happen to be that fool James Randi (a fool in the matter of cold fusion, at least). Perhaps we should invite magic man Randi to ICCF-8 in Italy. It might be entertaining to watch him eat crow and then pull one out of his hat.

Note well: It is *pure coincidence* that our "Flying Pig" motif for this *Words to Eat* column is similar to Randi's "Pigasus" flying-pig theme. *Our* flying pig is an ironic derivative of the mocking words from CalTech Professor Steve Koonin against cold fusion in 1989. We suppose Randi pulled *his* Flying Pig out of a hat.

Brown continued from page 40

what to state.

After talking with the DOE people and examining their letter and that of the Health Services Department, and after talking with Bob Dzajkich, my observations are that: 1) radioactivity was not released into the environment, 2) radioactivity was not encapsulated and 3) by the process of elimination, only the DOE notion that "changing the shape of a radioactive material can reduce its radioactivity" is left to account for the drastic drop in radioactivity readings—from 1000 counts to 40 —according to the DOE figures. This I find too bizarre to accept.

Therefore, I conclude that in Yull Brown's demonstration to the DOE Environmental Restoration and Waste Management Division of August 6, 1992, transmutation of radioactive material was accomplished, resulting in a drop in Geiger readings from 1000 counts to 40 counts, a 96% reduction of radioactivity or, inversely, resulting in a radioactive waste residue of about 4% of the original pre-treatment radiation level (or less when accounting for natural background radiation levels).

•—•—•

The Canadian government's Federal Environmental Assessment Review Panel issued in March 1992 Final Guidelines for the preparation of an Environmental Impact Statement on the Nuclear Fuel Waste Management and Disposal Concept. Such environmental impact statements (EIS) will have to be prepared by the proponent, Atomic Energy of Canada Limited (AECL). Under the guidelines, the EIS must discuss the capability of possible alternatives in order to address the risks to the health of humans and human communities, and to the work site and the natural environment. Of pertinence to the case of Dr. Yull Brown's proven method, the EIS would have to include "consideration of the transmutation of nuclear fuel waste."

•—•—•

"It has been my good pleasure to witness experiments done by Dr. Yull Brown in which it appeared to me that he significantly reduced the radioactivity in several nuclear materials. Under the circumstances, I believe it is very important for our federal government to completely investigate Dr. Yull Brown's accomplishments in this area."

—Hon. Berkeley Bedell, Former Member of U.S. Congress

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VIDEO TAPES of the

Third and Fourth International Symposiums on New Energy (1996 and 1997)

are available through Cold Fusion Technology, Inc.

ISNE3 - 1996

TAPE #	SPEAKER	LECTURE TITLE
1-AA	Hal Fox.....	Cold Fusion: Three New Types of Energy
2-AA	Ron Kovac.....	Plasma Shaping: New Mass & Energy Source
3-AA	Dennis Cravens.....	Patterson Fuel Cell
4-AA	Tom Valone.....	Free Energy & Propulsion
5-AA	James Griggs.....	The Hydrosonic Pump
6-AA	Eugene Mallove.....	Cold Fusion & New Energy
1-BB	Harold Aspden.....	Vacuum Spin as New Energy Source
2-BB	Paul Pantone.....	G.E.E.T. Device
3-BB	Moray King.....	The Super Tube
4-BB	Robert Golka.....	Ball Lightning
5-BB	R.M. Santilli.....	Hadronic Energy: New Subnuclear Source
6-BB	John Earle.....	Windmill Energy
7-BB	A. Michrowski.....	Brown's Gas/Energy Autonomous Homes
9-BB	Brian O'Leary.....	Free Energy, O Point & Consciousness
10-BB	Yost/Hull.....	Tesla Coils, Electrostatics, & Electric Propulsion
13-BB	Josef Gruber.....	Economic Effects of Space Energy Tech.
14-BB	Glen Rein.....	Anomalous Info. Storage in Water
15-BB	Larry Davenport.....	Towards Flight without Stress, Strain or Weight
16-BB	Tom Bearden.....	Regauging and Multivalued Potentials
17-BB	Mike Fisher.....	How to Market Your Advanced Technology
18-BB	A & P Correa.....	Pulsed Abnormal Glow Discharge Reactor
19-BB	Dale Pond.....	The Keely Musical Dynasphere
21-BB	Robert Emmerich.....	On Energy Measurement
24-BB	Martin Burger.....	Tidal Power
25-BB	Jeane Manning.....	The Coming Energy Revolution
26-BB	George Wiseman.....	Solid State Energy
27-BB	Gerald Orlowski.....	50 HP Free Energy Unit
1-WS	Dale Pond.....	Workshop
2-WS	A. Michrowski.....	Workshop
3-WS	Paul Pantone.....	Workshop - GEET Device
4-WS	Eugene Mallove.....	Workshop - Cold Fusion/New Energy
5-WS	Brian O'Leary.....	Workshop
9-WS	Dennis Cravens.....	Workshop-Patterson Cell
11-WS	Tom Valone.....	Workshop
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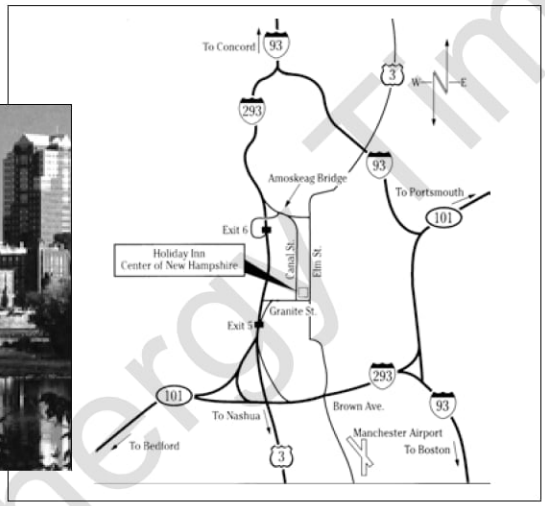

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Fred Jaeger (ENECO, Salt Lake City)
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Professor Peter L. Hagelstein
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"Cold Fusion: What We Know and What We Don't Know"

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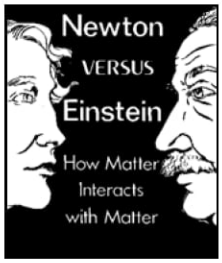

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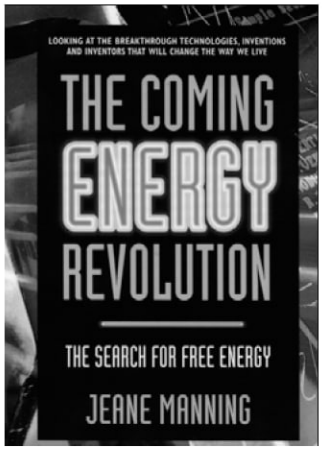

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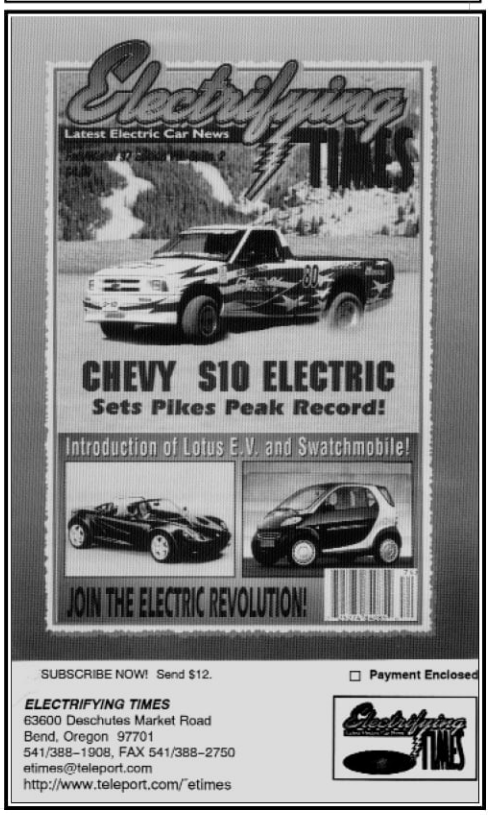

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Rhodium-Catalyzed Fusion in Palladium

H. C. Josephs, MEE, Ret.
Guadalupita, MN USA

Possible nuclear processes which would account for many of the reported experimental results[1] of cold fusion experiments of the Fleischman-Pons type[2] have been recently proposed.[3] More recently published results[4] lend additional support to the proposed model and aid in refining it.

Introduction

The experimental results reported by Melvin Miles *et al.*[4] support measurements and observations reported by others. In particular, the production of He-4 in sufficient amounts to account for the excess energy produced, the production of amounts of tritium and radiation insufficient to account for the excess power produced, a "charging" time of several weeks, sensitivity to agitation, and sudden onset and termination of heat production are more firmly established. New results reported are the improved success ratio for heat production with the addition of 0.25% to 0.75% boron to the palladium cathode and the shortening of the "charging time" through the co-deposition of palladium and deuterium. Also documented are the extreme non-reproducibility of the effects and erratic fluctuations in excess power levels, including frequent episodes of negative excess power.

A sequence of nuclear processes which can take place in palladium has been proposed[3]. The sequence proposed involves the production of rhodium 103 by the, admittedly very infrequent, stripping of a neutron from a deuteron by a palladium 102 nucleus. The resulting Pd-103 then decays to Rh-103 with a half-life of 17 days[5]. Rhodium 103, 104 and 105 have thermal neutron capture cross sections of 140, 800 and 5000 barns respectively,[5] so the probability of neutrons being stripped from deuterium is significantly higher. The proposed sequence then hypothesizes that Rh-105 captures entire deuterons to produce tritium and helium 3 in equal amounts without radiation (other than that produced by the tritium and by β-decay of the Rh-105 by a two-step process. Also hypothesized is a one-step process by which He-4 is produced by the capture of two deuterons in an energetic state of the Rh-105 nucleus. The α-particle is then ejected, sharing the reaction energy with the Rh nucleus in inverse proportion to their masses.

Discussion

A. Fusion Products

In energetic deutron-deuteron collisions (hot fusion), the fusion products are tritium and He3 in approximately equal quan-tities, plus neutrons, protons and gamma rays needed to satisfy the various conservation laws. A portion of the reaction energy is carried off by the proton or neutron so remaining energy is insufficient to disrupt the triton or He-3 nucleus. Helium 4 is almost never produced because the fusion energy plus the excess kinetic energy of the incoming deuterons exceeds the binding energy of the He-4 nucleus. Since there is no ejected particle to carry off this excess energy, the α-particle immediately decays into two deuterons. Any He-4 which is produced is immediately destroyed.

In the proposed[3] Rh-catalyzed fusion process, the deuterons are within the nuclear potential well when the fusion takes place. Because the α-particle appears to be a stable sub-unit of heavier nuclei and because it is energetically more favorable than either H-3 or He-3, it will probably be formed preferably to either of the latter. When it is formed within the nuclear potential well of Rh-105 by the capture of thermal deuterons, there is very little kinetic energy, only the 24 Mev of fusion energy. The rhodium nucleus can absorb 1.1 Mev as recoil energy, so the remaining 22.9 Mev is insufficient to disrupt the He nucleus. No gamma rays are necessary as the 22.9 Mev appears as kinetic energy of the α-particle. This proposed process is supported by the reported production[4] of He-4 in preference to He-3 or H-3.

B. "Charging" Time, "Second Try," Etc.

While a high D/Pd ratio will undoubtedly increase the probability of neutrons or deuterons being captured by either Pd or Rh and the capture process is random and unpredictable, probably the most rare and variable process in the proposed sequence is the capture of a neutron by even a single Pd-102 nucleus. Pd-102 constitutes only 1% of naturally occurring Pd[5]. Furthermore, the thermal neutron capture cross section of this isotope is only three barns[5] and the cross section for neutron stripping plus capture is undoubtedly significantly lower. The reason one might expect to observe this process at all in an electrolysis chamber is the long exposure time and the high concentration of deuterium. The experimental results indicate that the rate of capture in the cells being used may be on the order of one per day. As the minimum reported time from the application of current to the cell until the onset of excess heat is one week[4], the concentration of deuterium in the Pd reaches a high enough level to initiate neutron capture within that time. Perhaps a better estimate of the true charging time is indicated by the excess power of about 6.5 mW due to the heat of absorption of deuterium[4]. Miles reported that this decreased to zero after about two hours at 35 mA. The onset of heat production is therefore delayed by something other than the loading of palladium with deuterium.

Other random processes which will delay the onset of heat production are the decay time of Pd-103 to Rh-103 and the subsequent neutron captures by the Rh isotopes. Because we are consid-ering the generation of as few as one Pd-103 atom per day and the half-life of Pd-103 is 17 days[5], that one atom might decay to Rh-103 on the day it is generated or last for years before it decays. One certainly could not count on Rh-103 being reliably produced in two or three weeks. If a cathode is charged with deuterium and no anomalous activity is noted, setting it aside for a few weeks to allow more time for the Pd-103 to decay would improve the probability of success. This was observed by Miles in some cases where a cathode was tried a second time.

On the average, half the Pd-103 atoms would decay to Rh-103 in 17 days. Thus one might expect a half-dozen rhodium atoms to be present after three weeks, but to attempt to predict the fate of any one radioactive atom is futile. The best one can do is to state that one could expect an average time delay of 17 days in

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addition to the time required to build up the deuterium concentration to the necessary level. The remaining processes must proceed rapidly or they will fail due to the relatively short half-lives of Rh-104 and Rh-105[5]. Because of the large cross sections of these two isotopes, one would expect that those processes could occur with much greater rapidity, especially those taking place in Rh-105.

Because of the extremely large cross section of Rh-105 (5000 barns), one would expect that its ability to capture neutrons would be limited mostly by the availability of neutrons to capture. The statement may not be valid for deuterons, as the deuteron capture cross section is unknown. Once the deuterons are captured, however, fusion and ejection of the α must take place almost instantaneously. The helium production rate for a single Rh-105 atom would undoubtedly be limited by the rate at which deuterons can be supplied. Excess heat being produced at the rate of 100 mW would require 2.6×10^{11} fusions per second. The reported results of 50 to 300 mW are consistent with there being only one or a few Rh-105 atoms active at any one time. The 35.4 hour half-life of Rh-105[5] also suggests that any one burst of activity will only persist for a day and a half on the average, but usually would be much shorter or longer than that. Because of the likelihood of lattice damage resulting from the α-particle bombardment and the intense concentration of heat, a single atom producing all this activity will probably soon find itself electrically isolated from the Pd and therefore become inactive. One could therefore expect that any one atom remains active for considerably less than 35 hours.

Based on the above discussions, if the Pd is fully charged one would expect that excess heat production would begin essentially at the instant that the first atom of Rh-105 is formed. The excess heat would then be expected to increase in a random step-wise manner as each additional atom of Rh-105 was formed. If the Pd is not initially fully charged, one would expect the increase in heat to be more gradual. The calorimeters that Miles et al. were using would not show a step function response due to their 25-30 minute time constants[4]. The excess heat should also decrease in a random step-wise manner as each Rh-105 atom decays to Pd-105 or is removed from contact with the cathode due to mechanical vibration. If atoms of Rh-105 become isolated due to lattice damage, one would expect the decrease in excess heat to be more gradual. The rapid onset and termination of anomalous activity has been reported by other experimenters[1,3] and is verified by Miles.

C. Additives

The addition of boron to the cathode material was interesting, as 20% of naturally occurring boron is B-10[5], which has a thermal neutron capture cross section of 3837 barns[5]. Presumably B-10 will have a non-zero probability of splitting a deuteron and capturing the neutron similar to part of the process proposed for Rhodium. In this case an α-particle is ejected and lithium 7 is produced with a yield of about 3 Mev. A boron atom is destroyed for each reaction that occurs, so boron is consumed rapidly. If the lithium remains in the cathode metal, it should be present in detectable quantities if this reaction were responsible for the excess energy and He-4 produced in these experiments. Costing only a few dollars per gram, boron would be an economically attractive nuclear fuel.

The addition of cerium to the cathode is more problematic, as none of the listed isotopes have known capture cross sections greater than a few barns.[5] Cerium would therefore not be expected to participate in neutron-capture events of the type described in the proposed fusion process. The element, however, is very active chemically and its oxides have heats of formation exceeding 100 kiloJoules per mole.[5] It was not specified how much cerium was present in the electrolysis cell, but several hundred grams would have been necessary to account for the excess energy reported, if the only reactions taking place were chemical. The indication is that the cerium did not directly participate in the production of excess heat. It may, however, facilitate the absorption of deute-rium in palladium as cerium is trivalent. The hydride exists[5] as CeH_3. The degree of deuteration of the palladium may improve with the addition of a small amount of cerium. Excessive cerium may disrupt the lattice structure of Pd. It is essential that the Pd lattice remain relatively intact in order that the deuterium ions be forced into close proximity to the Pd nuclei.

The most interesting addition may have been the inadvertent addition of rhodium to the system in the form of a rhodium-doped platinum anode.[4] This may have resulted in a small amount of rhodium being transported to the cathode where it could participate in the catalyzed-fusion process described. Because platinum - 10% rhodium or platinum - 13% rhodium wires are widely used as thermocouple wires in high temperature applications, they would be readily available to experimenters. Perhaps other experimenters have used rhodium-doped anode material without realizing or reporting it or recognizing the importance of the change.

Non-Reproducibility

Probably the largest cause of the apparent erratic fluctuations in excess power and even frequent episodes of negative excess is the use of a constant current source to excite the electrolysis cell. Assuming the cell voltage is two volts, then the cell voltage fluctuations of ± 0.1 volt will cause fluctuations in input power of ± 5%. When measurements are made, the temperature of the cell will always lag behind the power input changes unless the voltage fluctuations are bipolar about an unchanging average and rapid compared to the thermal time constant. For the average to be unchanging, the positive voltage x time product must equal the negative v x t product. If this is not the case, then the temperature will have to be constantly either rising or falling toward a new equilibrium level. If the temperature is rising, the excess power calculated will appear to be negative because the temperature is below that which would correspond to the calibrated equilibrium temperature for that power level. When the temperature is falling, a false excess power production would be recorded because the temperature of the cell is above that which would correspond to the calibrated equilibrium temperature. From the reported measurements on inactive cells, it appears that this effect produces fluctuations in excess power of ± 50 mW with peaks of ± 0.1 W.

In order to reduce the above problem, one can use a constant power source. This can be approximated by a constant voltage source in series with a fixed resistor chosen to be equal in value to the effective resistance of the cell. The easiest way to do this is to use a series rheostat in series with the voltage source and the cell. Set the rheostat to the anticipated E/I ratio of the cell, adjust the source voltage to twice the cell voltage and readjust the rheostat to obtain the desired current. If done properly, the circuit is delivering the maximum power to the cell. Any change in cell voltage will result in a decrease in power. For example: If

Josephs continues on page 77

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The Theory of Excess Energy in a PAGD Reactor (Correa Reactor)

Professor Lev G. Sapogin

Department of Physics, Technical University (MADI), Leningradsky pr. 64, A-219, 125829 Moscow, Russia

Tesla and Tandberg in their already old works first discovered a generation of very short and powerful bursts of electric current with an absolutely unknown nature under some certain conditions of a gas discharge on direct current. One did not pay any serious attention to that phenomenon. And only in the recent works of Paulo and Alexandra Correa was it shown that by creation of the conditions for abnormal gas discharge (PAGD - Pulsed Abnormal Glow Discharge) on direct current powerful bursts of alternating current appear. The energy of these bursts exceeds several times the consumed energy (up to 10 times). In this experiment one can observe that a part of electric current carriers (obviously electrons) gain high velocities which is the reason for excess energy generation. According to the unitary quantum theory it is possible to explain easily the generation of excess energy.[1,7-9] The electrons can oscillate with a high plasma frequency relatively to very heavy positive ions. Their behavior is possibly explained as oscillations in a potential well with the rims of various height. At some certain values of initial phase the approximate equation of the unitary quantum theory with an oscillating charge can yield the "maternity home" solution.[1,7-9] As a result of the electrons having gained a high energy with high velocity they fly out of the wells, and always in one direction. It is the energy generation process - and not nuclear reactions - that are responsible for excess energy creation. The mathematical process model is created and an approximate solution of the non-linear differential equation is achieved. The range of values of initial phases allowing the energy generation process is determined. If the experimental research of Tesla, Tandberg and Correa are correct then there is no doubt the future power industry would be developing in this direction and not in today's fashionable direction of the cold nuclear fusion. Similar phenomena probably take place in the device of Ken Shoulders' electrum Validum.[10]

Fantastic phenomena at certain gas discharge regimes (the anomalous gas discharge close to the arc regime) were discovered as far back as 1929 by Nikola Tesla.[2] It was revealed that, due to some unknown reason within a powerful pulse gas discharge in the course of one pulse very many extremely short current spikes occur (see Fig. 1). According to Tesla's estimation the energy resulting from these spikes exceeded the energy of the applied electric pulse. This fact was not paid much attention to at the time, because it was contrary to the existing physical thought. Tandberg was the next[3] to uncover this phenomenon, but he had related it to some mysterious processes taking place in the cathode. He had staged a number of experiments but did not manage to illucidate the nature of the phenomenon.

Still later Prof. V. I. Chernetskij[4] (and also Manfred von Ardenne, German physicist (private communication)) performed some calorimetric measurements within the deuterium-lithium discharge (see Fig. 2).

It was made clear that the heat generated in a jug with plasma appeared to be 1.5–2 times greater than the applied energy. Chernetskij had associated this excess heat with nuclear reactions allegedly taking place in the deuterium-lithium plasma, but neither neutrons, nor tritium was discovered, though these products were expected to be found in abundance.

Later Dr. P. Correa and A. Correa in Canada had built a reactor prototype, which generated excess pulse electric current.[5]

Correa's objective, as could be inferred from his patent,[5] was to create an effective gas-discharge direct-alternated current energy amplifier to use in electric cars with the help of common relaxation generator on the basis of a neon lamp. It was assumed that the electric motor operation was affected by changing the power voltage frequency, which from the energy viewpoint is more effective than the rheostat control of the direct current engine. In the course of the research it was discovered, according to Correa, that the relation of the output electric power to the input amount exceeded 10 times (see Fig. 3).

In its original form the Correa reactor has three electrodes, two of which are absolutely identical, that work in a two-cycle regime. The original design is shown in Figure 4). It seems that the two-accumulator (storage battery) system, in which one of the accumulators maintains the anomalous gas discharge and discharges, while at the same time the second one is charged. The accumulators then exchange their places.

From the physico-mathematical viewpoint it is clear that if the "maternity home" solution is realized in a symmetrically parabolic potential well with identical walls, then there will be no excess electric current. Half of the electrons, having acquired

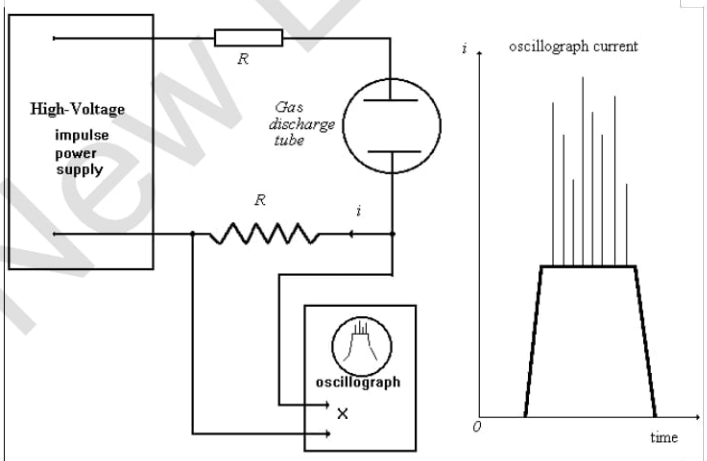

Figure 1. N. Tesla and R. Tandberg's first experiment.

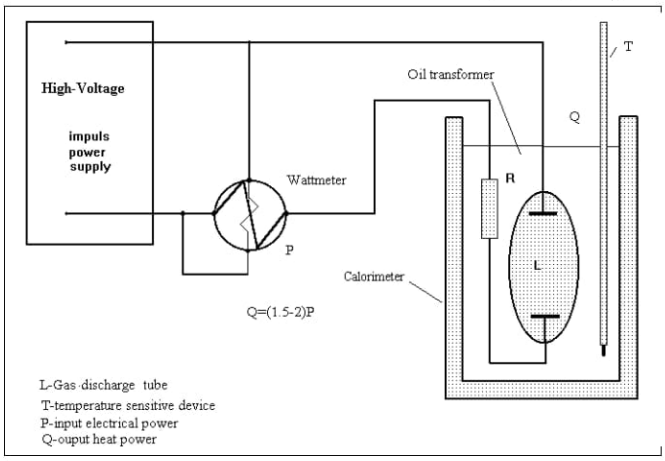

Figure 2. Prof. Chernetsky's experiment.

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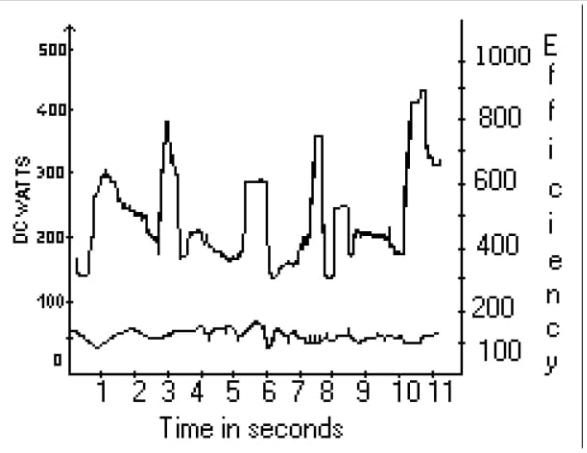

Figure 3. Efficiency as % of breakeven.

energy, will flow to the left while the second half will be directed to the right (see Fig. 5) and these currents will compensate for each other. But if we take the well walls to be asymmetric, all the electrons subject to the "maternity home" solution will flow to the left and contribute to the quickly alternating excess electric current component (Fig. 6).

In so doing the evident inequality should be fulfilled (see Fig. 6):

$$W << U_1 - U_2 \qquad (1)$$

where W is the energy obtained by the electrons in the "maternity home" solution within one period of oscillations.

We shall show that in a gas discharge plasma the situation described in Figure 6 is possible. Let us consider the uniform plasma layer of l thickness and transfer all the electrons to an x distance. We shall arrive at a plane capacitor with an electric field between the plates

$$E = \frac{\sigma}{4\pi\varepsilon\varepsilon_0}$$

Where σ is the surface charge density $\sigma = en_x$ **

Then $E = \frac{en_x}{4\pi\varepsilon\varepsilon_0}$

This uniform electric field affects both electrons and ions, but the latter will be at rest because of their big mass, so their motion can be neglected.

The force acting upon the area square in a layer of l thickness is equal to the product of the layer's charge Q value into the field voltage

$$F = -QE = -en_lE = -\frac{e^2 n^2 lx}{4\pi\varepsilon\varepsilon_0} = -kx$$

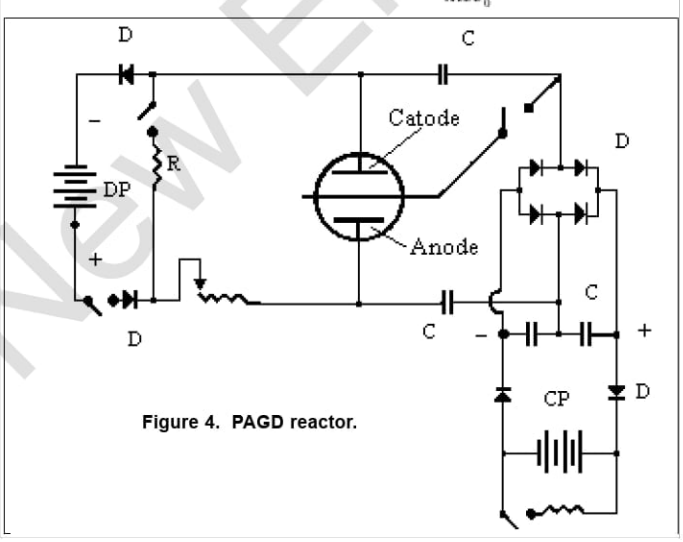

Figure 4. PAGD reactor.

This force acts upon the M mass of all electrons available on the square unit

$$M\frac{d^2x}{dt^2} = -kx$$

where $M = n_m_l$. Of course $\omega = \sqrt{\frac{k}{M}}$

and then

$$\omega_p = \frac{4\pi\varepsilon\varepsilon_0 n_e^2}{m_}$$

The obtained frequency of plasma or Langmuir oscillations is usually within the limits 10^9 - 10^{13}. Such plasma oscillations differ from the wave process as they do not spread out in environment, in other words, some local disturbance remains local in character. The obtained differential equation for the plasma oscillations coincides with the conventional harmonic oscillator equation.

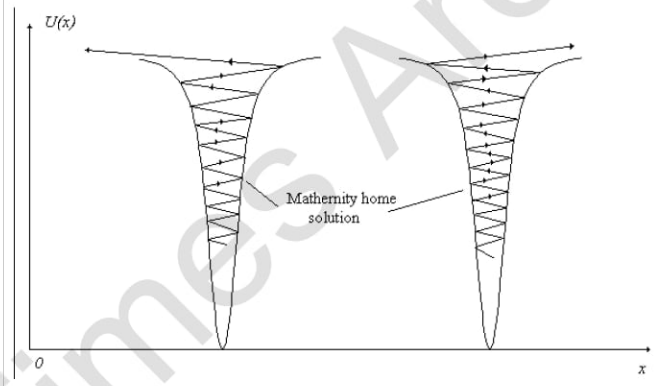

Figure 5. Maternity home solution in symmetrical potential well (excess electrical current is absent).

It is clear, that in the electrons collective movement each is also subject to this equation and due to this, I can now use the main oscillating charge equation.[1,7,8] Proceeding from simple physical reasoning it becomes evident that if the current flows, it means that the potential well has a wall. Although the well is symmetric by nature, it will become distorted in strong electric field conditions, its appearance reminiscent of that shown in Figure 6. Such a potential can be easily simulated by a simple function:

$$U(x) = ax + b\arctan(x^2)$$

Then, the main equation to describe processes taking place inside the Correa reactor will assume the following form[1,7-9]:

$$m\frac{d^2x(t)}{dt^2} = \left(a + 2b\frac{x(t)}{1+x(t)^4}\right)\cos^2\left(\left(\frac{dx(t)}{dt}\right)^2\frac{mt}{2\hbar} - x(t)\frac{dx(t)}{dt}\frac{m}{\hbar} + \phi\right) \qquad (2)$$

The digital mathematical simulation results are presented in Figure 7. These results show that there is a certain region of initial values in which all the electrons, accelerated by the "maternity home" solution will flow in one direction. These very fast electrons will be responsible for the anomalous excess heat on the anode (discovered by Chernetskij and Correa), it is the current spikes at the top of the pulses that contribute to the excess useful electric current component.

Accurate analytical solution for this very complicated equation is hardly possible. Yet it became possible to obtain an analytical solution in the form of a series.

Let us find equation (2) solution in a form:

$$x(t) = (1 + \lambda(t))\cos(\omega t)$$

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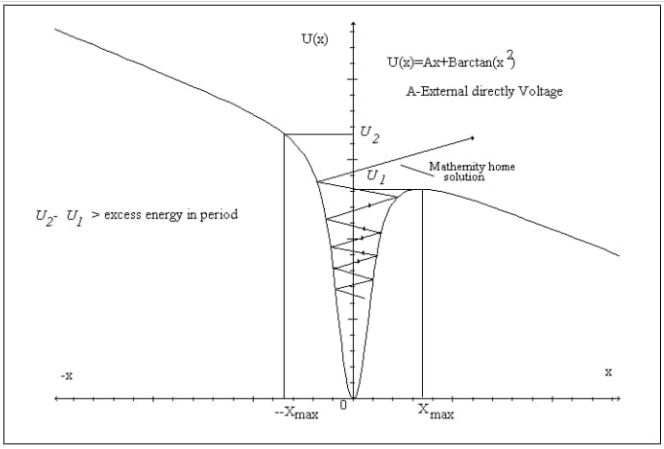

Figure 6. Processes in PAGD discharge.

After substitution into equation (2) we have a new equation for $\lambda(t)$:

$$\frac{d^2\lambda(t)}{dt^2}\cos(\omega t)+\frac{d^2\lambda(t)}{dt^2}\cos^5(\omega t)-\cos^5(\omega t)\omega^2-\cos(\omega t)\omega^2+4\frac{d^2\lambda(t)}{dt^2}\lambda(t)\cos^5(\omega t)+$$
$$6\frac{d^2\lambda(t)}{dt^2}\cos^5(\omega t)\lambda(t)^2+4\frac{d^2\lambda(t)}{dt^2}\cos^5(\omega t)\lambda(t)^3+\frac{d^2\lambda(t)}{dt^2}\cos^5(\omega t)\lambda(t)^4-5\cos^5(\omega t)\omega^2\lambda(t)-$$
$$10\cos^5(\omega t)\omega^2\lambda(t)^2-10\cos^5(\omega t)\omega^2\lambda(t)^3-5\cos^5(\omega t)\omega^2\lambda(t)^4-\cos^5(\omega t)\omega^2\lambda(t)^5-$$
$$\cos(\omega t)\omega^2\lambda(t)+QA^2a-2\frac{d\lambda(t)}{dt}\sin(\omega t)\omega\cos^4(\omega t)-8\frac{d\lambda(t)}{dt}\sin(\omega t)\omega\cos^4(\omega t)\lambda(t)-$$
$$12\frac{d\lambda(t)}{dt}\sin(\omega t)\omega\cos^4(\omega t)\lambda(t)^2-8\frac{d\lambda(t)}{dt}\sin(\omega t)\omega\cos^4(\omega t)\lambda(t)^3-$$
$$2\frac{d\lambda(t)}{dt}\sin(\omega t)\omega\cos^4(\omega t)\lambda(t)^4+QA^2a\cos^4(\omega t)+4QA^2a\cos^4(\omega t)\lambda(t)+$$
$$6QA^2a\cos^4(\omega t)\lambda(t)^2+4QA^2a\cos^4(\omega t)\lambda(t)^3+A^2Qa\cos^4(\omega t)\lambda(t)^4+QA^2b\cos(\omega t)+$$
$$QA^2b\cos(\omega t)\lambda(t)-2\frac{d\lambda(t)}{dt}\sin(\omega t)\omega=0; \qquad (3)$$

where $A=\cos\left(B^2t-B(1+\lambda(t))\cos(\omega t)\omega+\phi\right)$

and $B=\frac{d\lambda(t)}{dt}\cos(\omega t)-(1+\lambda(t))\omega\sin(\omega t)$

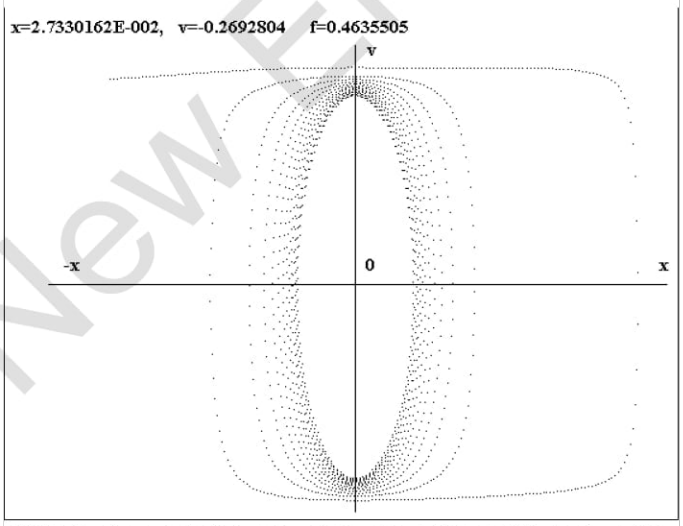

Figure 7. Phase portrait for Correa's reactor. "Mathernity home" solution.

The series solution of equation (3) for natural case

$\lambda(0)=0,\ \frac{d\lambda(t=0)}{dt}=0$ have a form:

$$\lambda(t)=\left(-\frac{Qa}{2}\cos^2(\phi)+\frac{\omega^2}{2}-\frac{Q}{4}b\cos^2(\phi)\right)t^2+$$
$$\left(\frac{Q^2}{3}\cos^3(\phi)a^2\sin(\phi)+\frac{abQ^2}{3}\cos^3(\phi)\sin(\phi)+\frac{b^2Q^2}{12}\cos^3(\phi)\sin(\phi)\right)t^3+$$
$$\left(\frac{5\omega^4}{24}-\frac{b^3Q^3}{32}\sin^2(\phi)\cos^4(\phi)-\frac{3ab^2Q^3}{16}\sin^2(\phi)\cos^4(\phi)-\frac{a\omega^2Q}{4}\cos^2(\phi)-\right.$$
$$\frac{abQ^2}{48}\cos^4(\phi)+\frac{b^3Q^3}{96}\cos^6(\phi)-\frac{b^2Q^2}{96}\cos^4(\phi)-\frac{b\omega^2Q}{8}\cos^2(\phi)-$$
$$\frac{a^3Q^3}{4}\sin^2(\phi)\cos^4(\phi)+\frac{a^3Q^3}{12}\cos^6(\phi)+\frac{a^2bQ^3}{8}\cos^6(\phi)+\frac{ab^2Q^3}{16}\cos^6(\phi)-$$
$$\left.\frac{3a^2bQ^3}{8}\sin^2(\phi)\cos^4(\phi)\right)t^4+\left(\frac{19ab^2Q^3}{240}\cos^5(\phi)\sin(\phi)+\frac{b^3Q^3}{60}\cos^5(\phi)\sin(\phi)+\right.$$
$$\frac{7a^2bQ^3}{60}\cos^5(\phi)\sin(\phi)+\frac{ab\omega^2Q^2}{6}\cos^3(\phi)\sin(\phi)+\frac{a^3Q^3}{20}\cos^5(\phi)\sin(\phi)+$$
$$\frac{b^2\omega^2Q^2}{24}\cos^3(\phi)\sin(\phi)+\frac{a^4Q^4}{5}\cos^5(\phi)\sin^3(\phi)-\frac{Q^4a^4}{5}\cos^7(\phi)\sin(\phi)+$$
$$\frac{a^2\omega^2Q^2}{6}\cos^3(\phi)\sin(\phi)+\frac{2a^3bQ^4}{5}\cos^5(\phi)\sin^3(\phi)+\frac{3a^2b^2Q^4}{10}\cos^5(\phi)\sin^3(\phi)-$$
$$\frac{b^4Q^4}{80}\cos^7(\phi)\sin(\phi)+\frac{b^4Q^4}{80}\cos^5(\phi)\sin^3(\phi)+\frac{b^3Q^4a}{10}\cos^5(\phi)\sin^3(\phi)-$$
$$\left.\frac{3a^2b^2Q^4}{10}\cos^7(\phi)\sin(\phi)-\frac{ab^3Q^4}{10}\cos^7(\phi)\sin(\phi)-\frac{2a^3bQ^4}{5}\cos^7(\phi)\sin(\phi)\right)t^5+O(t^6)$$

In Figure 8 there is plot surface for If λ $\lambda(t,\phi)$.
If $\lambda>0$ then there are "maternity home" processes, if then there are a "crematorium" solution. For good excess of electrical energy we must choose an area where $\lambda>0$ and suppress the "crematorium" solution. This is a very complicated problem!

For researchers studying the Correa plasma reactor this theory gives us an opportunity to make the following important statements:

1. The cathode processes have nothing to do with excess heat, therefore the [3]-type research is useless.

2. Inequality (1) is possible at large enough currents, which is easier to obtained in a impulse regime.

3. The plasma composition is not very essential, ionization potential serving as a single criterion of importance, but it is desirable to choose this one being as small as possible.

4. At large currents cathode electrode disssipation is inevitable, which leads to the metal erosion and its deposition on the flask (retort) walls, which shortens the device life. Correa had used aluminium for the electrodes and this was not a very successful decision. Use of liquid metals (for instance, Hg - mercury with a sufficiently small output work) for the electrodes seems to be more expedient. Having been condensed on the walls it would flow down to the liquid electrodes. Such electrodes would have a very long service. It is natural that further

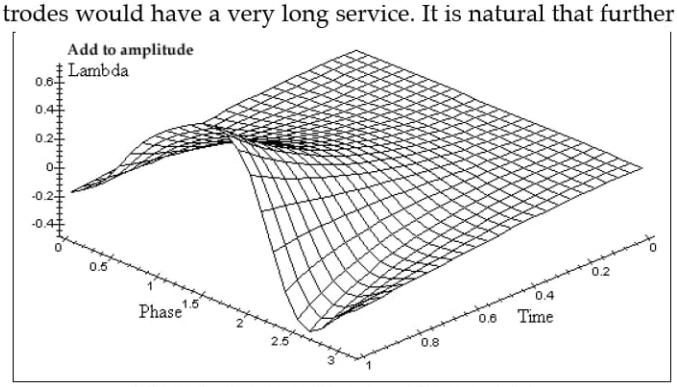

Figure 8. This is surface for add to amplitude.

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recommendations could be made after many precise experiments only.

I wish to express my gratitude to my collegues Ryuichi Kubota (Japan), V. Dzhanibekov, Mike Carrell (USA), Dr. P. Correa and A. Correa (Canada) and professors V.S. Barashenkov, A.P. Buslaev and M.A. Mokoulsky.

Lev Sapogin on the cover of a new Russian popular science journal for young people.

Footnote

** [n_ is the number of electrons (negative charge)]

References

1. Sapogin, L.G. *Chinese Journal of Nuclear Physics*, Vol. 17, No. 4, 1995); Vol. 19, No. 2, (1997).
2. Tribute to Nikola Tesla (presented in articles, letters, documents). *Beograd*. (1961).
3. Tandberg, R. "On the Cathode of an Arc Drawn in Vacuum," *Physical Review* 35, p. 1080, (1930).
4. Chernetskij, V. Private communication. (1976).
5. Paulo N. Correa and Alexandra Correa, "XS NRG™ Technology," *I Infinity Energy*, Vol. 2, No. 7, 8, 9, (1996); US Patents numbers 5.416.391, 5.502.354, 5.449.989.
6. M. Carrell, "An Overview of the Correa Invention,"*Infinite Energy*," Vol. 2, No. 8, 1996.
7. Sapogin L.G. *Nuovo Cimento*, 53A,251, (1979); 70B,80, (1982); 71B,246, (1980); 104A,1483, (1991).
8. Sapogin L.G. *Infinite Energy*, V. 1, No. 2, p. 38, (1995); Reports ICCF4, ICCF5, ICCF6, ICCF7.
9. Sapogin L.G. "Annales de la Fondation Louis de Broglie," V. 5, #4, p. 285, (1980); V. 9, #3, p. 221, (1984).
10. Nelson R. "Ken Shoulders' Electrum Validum,"*Infinite Energy*, Vol. 3, #18, p. 58-63 (1998).

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Miley continued from page 35

swered question, but one that has received much speculation, including some by Dr. Mizuno. Indeed, "why" applies to so many bizarre events and actions in this topsy-turvy and frequently "vicious" field of cold fusion. On the bright side, Dr. Mizuno recounts important help and encouragement he received from enlightened colleagues, administrators, and others in the field.

A theme brought out in the title of this book and pursued in later chapters is that cold fusion phenomena can be explained on the basis of nuclear transmutation reactions involving the metal lattice. While this is a tantalizing proposition, especially to someone like myself who has also studied such transmutations, I would suggest (and I suspect Dr. Mizuno would agree) that this conclusion may be premature. There are numerous issues yet to be investigated. For example, does the transmutation rate correlate with heat production? How do host metal transmutations fit with the preferential production of tritium reported in some experiments? How does it fit with ^{4}He production and experiments that correlate that with heat? How does it correlate with heat bursts reported in others? One possible explanation for these varied observations is that there may be various reaction regimes (or channels) which favor different reactions and products. In that case, the key question is whether or not there is a commonality involved through the initiating events. On a more detailed level, Dr. Mizuno stresses localized reaction site observations and "flower-petal" formations observed around deep holes formed at the electrode surface. I would add that such patterns are not observed in my own transmutation experiments using thin-films sputtered onto surfaces. Thus, it appears that the metallic structure, defects, etc., play an important role and may cause localized reaction sites in some cases whereas more uniform coverage occurs in others. Also, Dr. Mizuno relies on Conti's electron capture theory as coming closest to explaining transmutation experiments. Along these lines, I have placed stress on "signatures" from transmutation experiments, e.g. high yields of products in four or five relatively narrow mass number zones, lack of significant high-energy radiation but low-energy x-rays and betas, etc., as key aspects that theory must explain. Electron capture provides a possible initiation mechanism, but the subsequent process must be studied to benchmark theory against the key "signatures." Indeed, there were several new theories presented at ICCF-7 in an attempt to explain these "signatures." Thus again, as Dr. Mizuno states, research in this fascinating field of low energy reactions (LENRs) has "just begun to scratch the surface."

In conclusion, I find this frank and open exposition by Dr. Mizuno to be the most thoughtful, the most interesting, and the most helpful scientifically, of all the books to date about "cold fusion." Finally, I would take the liberty to add a personal note. Dr. Mizuno recalls that upon our first meeting at the Second International Conference on LENRs at Texas A&M, while I appeared deliberate and calm in my presentation, I also appeared to lack confidence. I would stress that this appearance was not due to a lack of confidence in the data, but due to my concern about which slides to eliminate in order to stay in the time limit for the talk. Dr. Mizuno is not the only one to find himself struggling to cram things into a brief talk!

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FORMATION AND PROPERTIES OF HYDREX AND DEUTEX

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ICCF-7 Paper

Abstract

Simple experiments have been carried out that show the possibility of transmuting elements in systems where hydrogen or its isotopes are contacted with metals able to give a metallic hydride, this metallic hydride being submitted to the action of a magnetic field. These transmutations can be explained by a new class of nuclear reactions: nucleon capture by HYDREX, a metastable state of hydrogen.

Introduction

The origin of the unusual phenomena (excess energy, transmuted products) observed when an hydrogen isotope is contacted with a metal lattice yielding a metallic type hydride, is still a subject of debate. Several explanations have been proposed, such as fusion reactions between the protons confined in the hydride lattice[1] or formation of a shrunken hydrogen atom in the constraining environment of the hydride lattice. The presenting author had put forward in 1993,[2] the concept of the virtual neutron (a very short living association between a proton and an electron) and made this concept evolve towards the HYDREX concept.[3,4] The (hopefully) final evolution of this concept is presented in this article. It is based on experiments that are simple and easy to reproduce and from which arises the description of HYDREX as an activated metastable state of hydrogen. This state is able to trigger a very specific class of nuclear reactions: the nucleon capture by HYDREX.

Experimental

A first series of experiments were run, using Uranium metal (N 0071) from the shelf, containing 99.3 % of $^{238}_{92}U$. Two samples of Uranium (sample A: 715 mg and sample B: 765 mg) were hydrided in two identical small reactors, using N 55 hydrogen (conditions: temperature 150°C and pressure 15 bars). The two identical small reactors (Figure l) consists of a 10 mm diameter stainless steel tube, lmm thick 50mm long. The tube is coated at the bottom part, by a lmm thick Teflon tube. Uranium metal (as 2 or 3mm pieces) was introduced at the bottom of the reactor, which was then closed by a steel cylinder. The loaded reactor was then placed in a bigger reactor, which was filled with hydrogen (15 bars) and heated at 150°C for 30 minutes, resulting in stoichiometric UH_3. The big reactor was then allowed to cool to room temperature and the small reactor was unloaded and then sealed by two O Rings to prevent any oxidation.

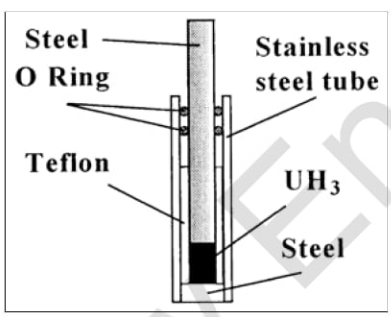

Figure 1

The uranium hydride (which was in the form of a powder) was then compacted at high pressure by placing the small reactor in a screw-press acting on the steel cylinder closing it.

The reactor containing sample A was then placed between two permanent magnets (1.2 T), and connected, according to Figure 2, to a pulse generator device (Pulses of 80 A, 20 µs duration, frequency 4,000 Hz). The resulting assembly was placed in a sample holder, allowing its precise and repeatable positioning in front of the beryllium window of a germanium gamma photons detector (SEPh ORTEC, detection range 15 keV to 2 MeV).

The reactor containing sample B was directly positioned in a similar sample holder as the one used for sample A, but with no magnets and no connection to the pulse generator.

The sample holders were then alternatively positioned in front of the gamma photons detector and the corresponding counts were registered for periods of 24h (86,400 s). The overall experiment was conducted over a total period of 30 days.

Figure 3 shows the evolution with time of the counts per day of both samples. It can be seen that, whereas sample B exhibits a constant number of counts per day over the whole period (with a standard deviation characteristic of the repeatability of the positioning of the sample holder), sample A shows a clear decrease of this number. The linear regression of the counts per day with time, yields an average decrease of activity of 250 counts/day, every day of the experiment. The initial counts of sample A being 531,000 counts per day, the decrease of activity of sample A, induced by the action of the magnets and the current pulses, can thus be estimated to be 1.2% in 30 days.

In order to check that this decrease of activity was not apparent and due for instance to the action of the magnets or the pulses of current on the detector, a second series of experiments were carried out on samples A and B. Both samples were oxidized (air 800°C during 5 minutes), resulting in stoichiometric U_3O_8. Sample A yielded 845 mg and sample B, 901 mg of U_3O_8. Both samples were then alternately counted on the same gamma photons detector, according to a procedure which is now described. The totality of sample A was stored in flask F_A and the totality of sample B in flask F_B. A sub-sample A of about 300mg was taken from flask F_A, placed on the sample holder and compacted by the action of a screw-press.

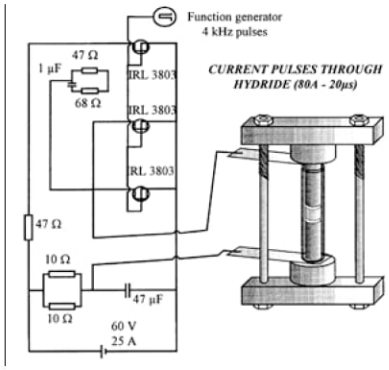

Figure 2

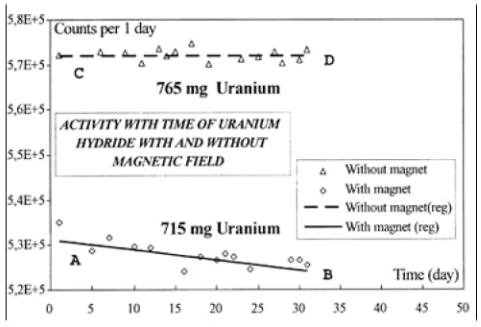

Figure 3

The sample holder was then positioned in front of the beryllium window of the germanium counter and the counts were registered on a period of two days (172,800s). The sub-sample was then replaced in flask F_A and the sample holder was cleaned. A sub-sample B of about 300mg was then taken from flask F_B and the same operations as for subsample A were carried out. The whole procedure was repeated three times, resulting in three countings of slightly variable weights (around 300mg) of

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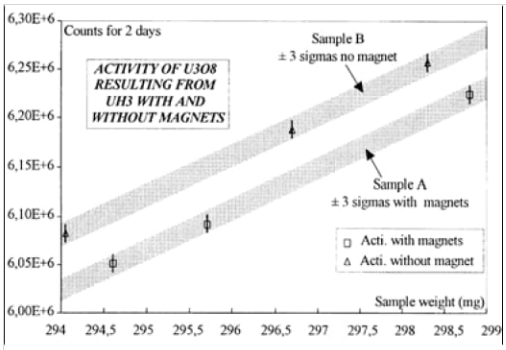

Figure 4.

each sample A and B.

The plot of the counts for each sample as a function of their weights is presented on Figure 4 which clearly shows a decrease of activity of sample A compared to sample B. This decrease amounts to 1% of the initial activity for the treated sample, to be compared to 1.2 % found in the first series of experiments. The grey filling on Figure 4 shows that the difference between samples is better than 3 sigmas.

Interpretation of this Result

The gamma activity of $^{238}_{92}U$, results essentially from the activity of its two daughters nuclei, $^{234}_{90}Th$ and $^{234m}_{91}Pa$ according to the well known chain:

$$^{238}_{92}U \xrightarrow[\alpha]{} {}^{234}_{90}Th \xrightarrow[\beta^-]{} {}^{234m}_{91}Pa \xrightarrow[\beta^-]{} {}^{234}_{92}U \qquad (1)$$

The $^{238}_{92}U$ gamma spectrum consist mainly of a few sharp γ rays characteristic of $^{234}_{90}Th$ and $^{234m}_{91}Pa$ and (for the majority) of the bremsstrahlung γ rays induced by the β^- emission of both nuclei (maximum energy for $^{234}_{90}Th$: 273 keV and for $^{234m}_{91}Pa$: 2.29 MeV).

A first interpretation of the measured decrease of the activity of the treated $^{238}_{92}U$, would be to invoke an increase of its alpha emission during the period of treatment, resulting after the treatment in a net decrease of the $^{238}_{92}U$ content and thus of its alpha emission. To assess this hypothesis, an estimation of the required increase of the alpha emission during treatment can be simply obtained by writing: $\lambda \approx \frac{dN}{N} \times \frac{1}{dT}$ with λ being the time constant, $\frac{dN}{N} = 0.012$ and dT = 30 days = 2.592 x 10^6 s. Thus the required time constant is $\lambda = 4.3 \times 10^{-9}\ s^{-1}$ (corresponding to a half life of 4.8 years) to be compared to the equivalent value for $^{238}_{92}U$, $\lambda_{^{238}_{92}U} = 5 \times 10^{-18} s^{-1}$.

Such an increase of the usual alpha emission of $^{238}_{92}U$, should thus induce, according to (1) a tremendous increase of the ~ photons emission. As this is not observed, another mechanism must be invoke to explain the results.

The HYDREX Concept

The stability of the Hydrogen atom and the order of magnitude of its dimensions can be understood by searching the distance r_o between the electron and the proton, at which the total energy of the electron $V+\overline{T}$ (potential ± kinetic), is minimum. Taking into account the Coulomb potential and the basic Heisenberg uncertainty relation $p\Delta x \geq \hbar$ between the electron position and its momentum, one easily finds that $V + \overline{T}$ is minimum and negative for $r_o = a_o$ (Bohr radius), dimension corresponding to a stable bound state, formed with the emission of photons of total energy 13.6 eV.

One can thus wonder if, in the constrained environment of the hydride lattice, another stable bound state of smaller dimension could be formed and thus with the emission of higher energy photons explain the excess energy observed. If only the Coulomb interaction is taken into account, the answer is clearly no (unless it is accepted that the basic Heisenberg uncertainty principle is violated, which has been proposed[5], but which is totally unacceptable). The addition of a second potential has been proposed to justify such a "shrunken hydrogen atom": the magnetic interaction between the nuclear magnetic moment of the proton and the magnetic moment of the electron.[6] This potential is third order compared to the Coulomb potential. So it must be first supposed that only in the confined environment of the hydride lattice can it yield a different proton/electron recombination scheme than the one yielding the normal hydrogen atom observed in free space. Under this preliminary assumption, a stability search (similar to the one applying to the normal hydrogen atom, but slightly more complicated) can be done, taking into account the hyperfine magnetic interaction, in the case where the magnetic moments of the proton and the electron are parallel and have the same direction. It can indeed be shown, that at short distance from the proton (a few fm) the total energy $V + T$ of the electron became negative, but no minimum is found. This is due to the fact that the classical hyperfine magnetic hamiltonian do not describe properly the electron/proton interaction at close distance (less than 100 fm). Indeed it is accepted that the most recent theories can only explain the four or five first figures of the hydrogen hyperfine structure constant.[7]

To arrive at the HYDREX concept, the following hypothesis are thus put forward:

- At short distance from the proton, the electron/proton interaction must take into account the action of the electron on the quarks of the proton (polarizability of the proton). It is assumed that this interaction creates a repulsive potential and thus the total energy of the electron exhibits a minimum at a few fm from the proton.
- This minimum energy is positive, which means that the bound state created is a *metastable bound state*, with no emission of photons, in agreement with experimental observations. After a time (which can be evaluated in days, from experimental evidence), this metastable state reverts to normal hydrogen atom, with the emission of photons of total energy equal to 13.6 eV.

The proposed HYDREX can thus be described as:

- a very small (5 to 10 fm) metastable bound state of hydrogen, formed without emission of photons, with life time estimated in the range of days, after which it reverts to normal hydrogen with the emission of 13.6 eV photons.
- a linear oscillator and thus a permanent electric and magnetic dipole.

It will now be shown that HYDREX, thus defined, can trigger a completely new class of nuclear reactions: the nucleon capture by HYDREX, and that its properties can account for all experimental observations in the field.

Nucleon Capture by HYDREX

HYDREX (which we note $^1_1\vec{H}$) being a small and permanent electric dipole, can reach the very close (few fm) vicinity of a "PARTNER NUCLEUS" (which we note "PN"). $^1_1\vec{H}$ *is* oriented so that its electron is in contact with "PN". This results in a local decrease of the Coulomb barrier and in a local overlapping of the nuclear wave functions of $^1_1\vec{H}$ and"PN."The detailed characteristics of this close contact will depend upon the characteristics of "PN" such as its nuclear magnetic moment and its quadrupolar (or higher) electric moment. If $^1_1\vec{H}$ can combine exothermically with a few nucleons of "PN" (those that are close to), a $^1_1\vec{H}$ nucleon capture by HYDREX will take place. This will be first illustrated with "PN" being an actinide: $^{238}_{92}U$ used in the experiments.

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$$^{238}_{92}U + ^{1}_{1}\vec{H} \longrightarrow ^{232}_{90}Th + ^{7}_{3}Li + 4.29 \text{ MeV} \quad (2)$$

In this reaction, $^{1}_{1}\vec{H}$ picks-up 2 protons and 4 neutrons from "PN". This is different from alpha emission and the resulting formation of $^{232}_{90}Th$, which has an half life time of 1.41×10^{10} years, explains the absence of increase of activity during the treatment of $^{238}_{92}U$ as reported above. Mass spectrometry analysis and calorimetric measurements are planned.

Let us now consider the case of "PN" being an isotope of platinum.

$$^{194}_{78}Pt + ^{2}_{1}\vec{H} \longrightarrow ^{190}_{76}Os + ^{6}_{3}Li + 2.9 \text{ MeV} \quad (3)$$

In this reaction, DEUTEX captures 2 protons and 2 neutrons from platinum to yield lithium 6, platinum being transmuted into osmium. This reaction could explain results reported in Ref. 4, where platinum disappears and lithium appears in a treated cathode compared to a virgin one (osmium was not measured).

If "PN" is a small nucleus (lithium/beryllium), interesting nucleon capture reactions can occur, for instance the three following ones.

$$^{7}_{3}Li + ^{1}_{1}\vec{H} \longrightarrow ^{4}_{2}He + ^{4}_{2}He + 17.4 \text{ MeV} \quad (4)$$

$$^{7}_{3}Li + ^{2}_{1}\vec{H} \longrightarrow ^{5}_{2}He + ^{4}_{2}He \longrightarrow ^{4}_{2}He + ^{1}_{0}n + ^{4}_{2}He + 15.1 \text{ MeV} \quad (5)$$

$$^{9}_{4}Be + ^{2}_{1}\vec{H} \longrightarrow ^{8}_{4}Be + ^{3}_{1}H \longrightarrow 2x\,^{4}_{2}He + ^{3}_{1}H + 4.7 \text{ MeV} \quad (6)$$

In reaction (4), HYDREX captures one proton and two neutrons to give $^{4}_{2}He$ (*captured* nucleus $^{7}_{3}$"CN"), *Li* (*partner* nucleus "PN") being transmuted $^{4}_{2}$ into *He* (*transmuted* nucleus ''TN").

In reaction (5), DEUTEX captures one proton and one neutron to give $^{4}_{2}He$ ("CN"), $^{7}_{3}Li$ ("PN") being transmuted into $^{5}_{2}He$ ("TN") which immediately gives a neutron and $^{4}_{2}He$.

In reaction (6), DEUTEX captures one neutron to yield $^{3}_{1}H$ ("CN"), $^{9}_{4}Be$ being transmuted into $^{8}_{4}Be$ ("TN") which immediately gives $^{4}_{2}He + ^{4}_{2}He$.

These reactions could explain the production of helium 4, tritium and neutrons observed in many experiments.

$$^{A}_{Z}PN + ^{1}_{1}\vec{H} \xrightarrow[\text{nucleon capture}]{} ^{A-a}_{Z-z}TN + ^{a+1}_{z+1}CN$$

$$^{A}_{Z}PN + ^{2}_{1}\vec{H} \xrightarrow[\text{nucleon capture}]{} ^{A-a}_{Z-z}TN + ^{a+2}_{z+1}CN$$

More generally, the following types of nucleon capture could be observed:
with "PN" being the partner nucleus, "TN" the transmuted nucleus and "CN" the captured nucleus.

The occurrence and the extent of these reactions will depend, among others, on the following parameters:

- the exothermicity
- the magnetic properties of "PN"
- the spins of the reaction products "TN" and "CN"
- the Fermi levels of "PN", "TN" and "CN".

How HYDREX Deactivates

Being a metastable state, HYDREX should deactivate after a time that can be estimated, from experimental evidences, to be in the order of days. First experimental data, that will be discussed now, suggest that this deactivation yields a normal hydrogen atom, with the emission of photons of total energy 13.6 eV.

Titanium powder (100 mesh), has been partly loaded with hydrogen (20 bars, 200°C) under a strong magnetic field (permanent magnet, 1.2 T), in a stainless steel reactor completely tight to light. This gave rise to an emission of photons, detectable by a photovoltaic cell, connected to a 20,000 Ω resistor by means of insulated connections through the reactor. This emission lasted for two months after loading, when the sample of titanium was kept in the dark in the reactor, under a magnetic field and at room temperature. This was shown by the voltage on the 20,000 Ω resistor staying at a value of 100 mV during this period (The total energy produced was thus some 60 J). It has been shown that this effect exhibits a threshold on the value of the magnetic field, which must be higher than 0.5 T. It has been checked that this emission is not due to the effect of hydrogen on the photovoltaic cell. It is not yet clear whether this emission is due to the upgrading of thermal energy of low temperature level into electricity or to the generation of energy by the recombination of a proton and an electron, which have to be generated (through an exothermal reaction) by loading the titanium with hydrogen.

Conclusion

The HYDREX concept, supported by simple experiments, can explain all the experiment observations that have been made in the field:

- The excess energy can have two origins, which can coexist in the same experiment. Either a nuclear origin by nucleon capture by HYDREX, or a chemical origin by deactivation of HYDREX.
- Loss of hydrogen can be explained by the very small size of HYDREX, which allows it to diffuse through the walls of the reactors.
- Heat after death can be explained by deactivation of HYDREX that can last longer than the end of an experiment. Another possibility is nuclear activity of transmuted nuclei, but this could be negligible because nucleon capture reactions often yield stable transmuted nuclei.
- The time needed before observing excess heat can be explained by the need to build a sufficient stock of HYDREX before nucleon capture can take place.

- The production of helium 4, tritium and neutrons can be explained by nucleon capture reactions by HYDREX, where the partner nucleus is a small one (lithium or beryllium). The amounts produced depend on the concentration of these small nuclei in the host metal lattice.

All this opens very interesting perspectives in the field of energy, such as: management of nuclear wastes, generation of energy from nucleon capture reactions, upgrading of low temperature energy sources and increase of the efficiency of photovoltaic cells.

Acknowledgement

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References

1. M. Fleischmann and S. Pons (1989), *Electroanal. Chem.* 261, 301.
2. J. Dufour (1993), *Fusion Technology*, 24, 205.
3. J. Dufour *et al.* (1997), *Fusion Technology*, 31, 198.
4. J. Dutour *et al.* (1996), *Proceedings ICCF6*, 2, 482.
5. R.L. Mills *et al.* (1991), *Fusion Technology*, 20, 65.
6. J.P. Vigier (1994), *Proceedings ICCF4*, 4, 7-1.
7. C. Cohen-Tannoudji *et al.* (1996), *Mécanique quantique*, 2, 1224.

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DETECTION OF ANOMALOUS ELEMENTS, X-RAY AND EXCESS HEAT INDUCED BY CONTINUOS DIFFUSION OF DEUTERIUM THROUGH MULTI-LAYER CATHODE(Pd/CaO/Pd)

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ICCF-7 Paper

Abstract

A new type of experimental apparatus is developed to induce nuclear reactions by continuous diffusion of deuterium. Ti atoms, which cannot be explained by contamination, were detected on the surface where deuterium atoms passed through on Pd cathodes after electrolysis. A multi-layer cathode (Pd/CaO/Pd) is introduced based on an ElNR(Electron Induced Nuclear Reaction) model. Excess heat generations and x-ray emissions were observed for all the cases we tried by the multi-layer cathodes. $^{57}Fe/^{56}Fe$ ratio of Fe atoms detected on the multi-layer cathodes is anomalously larger than natural $^{57}Fe/^{56}Fe$.

Introduction

Beginning in 1993, we have researched "cold fusion" phenomena to investigate its potentiality as a new energy source. At first, we performed gas-loading experiments and suggested that the high diffusion velocity of deuterium, in addition to a high D/Pd ratio, is an important factor for causing nuclear reactions in solids.[1-3] The authors analyzed electrolyzed Pd samples by a variety of methods,[4] and we conjectured that impurities in Pd play essential roles to induce nuclear reactions. The foregoing ideas result in the assumption that necessary conditions to induce nuclear reactions in solids are as follows:

(i) high D/Pd
(ii) enough diffusion flux of deuterium
(iii) the existence of a third element except Pd and deuterium.

A new type of experimental apparatus was developed to induce continuous diffusion under high D/Pd conditions, in which the conditions (i) and (ii) were satisfied.[5] A multi-layer cathode composed of a Pd sheet, Pd and CaO complex layer, and Pd thin layer is developed to meet the condition (iii). Ca is introduced into Pd cathode based on an Electron-Induced Nuclear Reaction(EINR) model.[6]

In this paper, experimental results using the continuous diffusion apparatus with both a normal Pd sample and the multi-layer cathodes is described.

Experimental

Figure 1 shows a cross sectional view of the continuous diffusion experimental apparatus.[3,6] An electrolyte of 1M $LiOD/D_2O$ and a vacuum chamber are separated by a Pd plate with an O-ring gasket(KARLEZ). Deuterium atoms are loaded by electrochemical potential into one side of the Pd sample and released from the other side. With this composition, it is possible to control the state of diffusion of deuterium by applied current or pressure of the vacuum side.

Excess heat is estimated by the flow calorimetry method. Heavy water (up to 99.9%) and LiOD (up to 99%) are provided by ISOTEC Inc. The electrolyte side of the apparatus consists of a cathode of Pd plate (25x25xlmm; 99.9% Tanaka Kikinzoku Kogyo K.K.), a circular shape of anode of platinum mesh (ϕ0.5mm; 99.98% Nilaco Co.), a recombiner and a cooling pipe for measurement of excess heat generation.

Pressures of the upper part of electrolyte and vacuum chamber are monitored by a pressure gauge and a BA gauge, respectively. At the beginning of electrolysis, argon gas is filled up at 1 atm in the upper space of the electrolyte.

The recombiner is prepared by electroplating Pt mesh in H_2PtCl_6 solution. In this apparatus, increase of pressure of the upper part of electrolyte corresponds to absorbed deuterium. Recombiner efficiency is calculated by the analysis of D_2 and 0_2 gases in the upper part of the electrolyte using a quadrupole mass spectrometer(AQA-360, ANELVA). Furthermore, temperature of the recombiner is always monitored to make sure that the recombiner works. We confirm that the recombiner works by the temperature and gas analysis. The usual recombiner efficiency that we measured was > 99%.

The cooling pipe is electroplated with gold (10μm thickness)

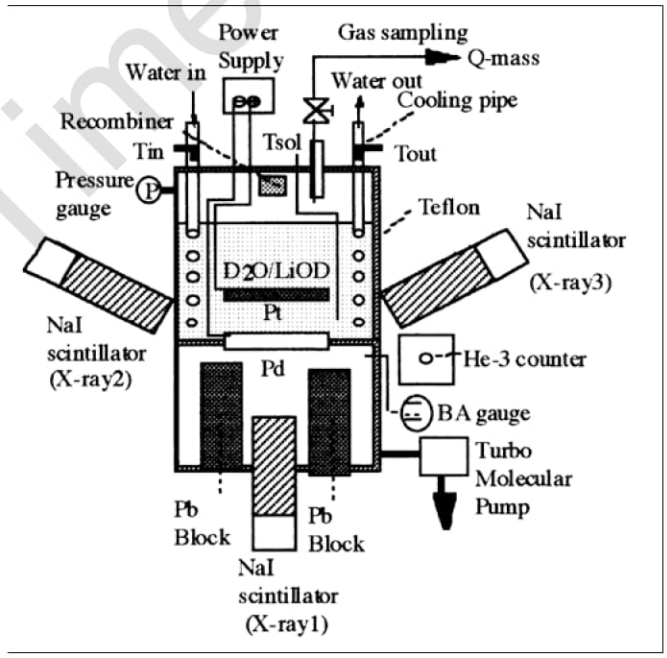

Fig. 1 Continuous Diffusion Experimental Apparatus

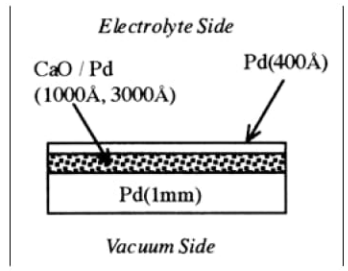

Fig. 2 Structure of a Multi-Layer Cathode

because Au is resistant to alkaline solution and it has good thermal conductivity. Flow rate of coolant (pure water) is always measured at two points: inlet and outlet sides. Two thermocouples each are provided to measure the inlet and outlet temperatures of the water. The solution, gas, recombiner and environmental temperatures are measured and consistency among these temperatures is always checked. The cell of the electrolyte side of the apparatus is made of Teflon.

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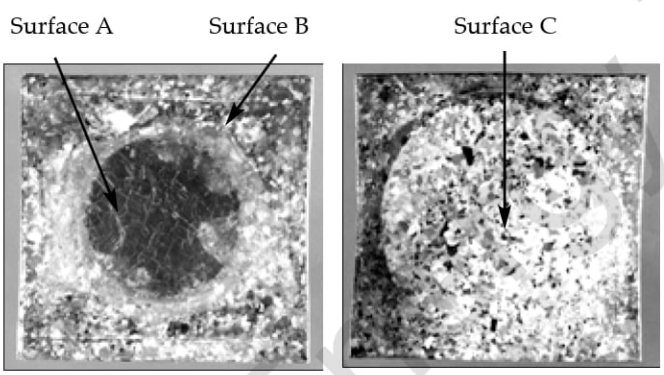
All experimental parts such as electric wires in the electrolyte side are coated with Teflon. The apparatus and measuring systems are located in a clean-room where temperature and humidity are always controlled at constant levels (23±1°C, 40±5%). Description on our nuclear measurement is provided in Ref. 5 and 6. The procedure for sample preparation is as follows. Pd plates were washed with acetone and annealed under vacuum condition (<10^{-7}torr) at 900°C for 10 hours. The samples were cooled down to room temperature in furnace and washed with aqua regia(D) for 100sec to remove impurity on the surface of the Pd samples. In the case of preparing a multi-layer cathode shown in Figure 2, the sample was covered with a complex layer which consisted of CaO and Pd. It was formed by simultaneously sputtering of CaO and Pd with Ar ion beam. Thickness of the layer was set from 1000Å to 3000Å. A thin Pd layer (400Å) was formed on it by ion beam sputtering to avoid dissolving CaO into D_2O/LiOD solution. The complex layer is put at near surface of the electrolyte side because we assume that nuclear reactions occur at the near surface.

Results and Discussion

Figure 3 shows the appearance of a normal Pd sample after experiments. Excess heat of about 1W lasted for 1 day in the case of the sample, although x-ray and neutron were not detected. The black circle of the electrolyte side (surface A) corresponds to the place where deuterium atoms passed through; it is the shape of the Pt anode. Surface B is the place where no deuterium atoms pass through. Similar black circles corresponding to the shape of the anode are observed on multi-layer cathodes. Contrarily, the appearance of the vacuum side of the Pd is the same as before experiments, independent of the deuterium passage.



(a) Electrolyte Side of Pd (b) Vacuum Side of Pd

Fig. 3 The Electrolyte and Vacuum Sides of Pd

Figure 4 shows the results of EDX (Energy Dispersive X-ray Spectrometry) for the surface A. Ti is clearly seen in the EDX spectrum. The Ti element was confirmed by WDX(wavelength dispersive X-ray spectroscopy), AES (Auger Electron Spectrometry), XPS (X-ray Photoelectron Spectrometry) and ICP-MS(Inductively Coupled Plasma Mass Spectroscopy). Those results are consistent with each other. On the other hand, no element except Pd is detected on the surface B and C.

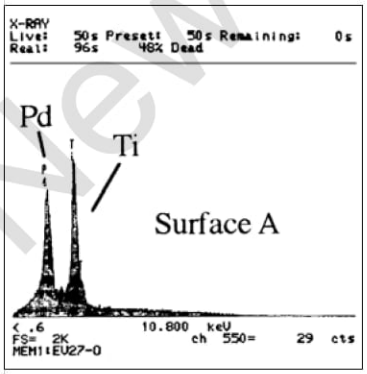


Fig. 4 EDX Spectrum forSurface A

Ti element on the black circle(surface A) was estimated 21ug by the ICP-MS. Maximum quantity of Ti contained in LiOD/D_2O solution and a Pt anode can be estimated 3.3 μg. The LiOD/D_2O solution was kept for 3 days in the cell before analysis. Mass of Ti in a whole Pd cathode before electrolysis is about 19μg. Therefore, the maximum total mass of Ti is 22.3μg which is the same order of the increased mass of Ti on the surface A.

ICP-MS analysis shows that total mass of Pt or Cu in the electrolyte, Pt and Pd is much larger than Ti. However, Pt and Cu was not detected on the surface A. It is very difficult to consider that only Ti elements were concentrated on the electrolyte surface where deuterium atoms passed through by an ordinary physicochemical process. After experiments, we keep the Pd samples in a desiccator in the clean room. The possibility of Ti being deposited on the Pd after the experiments is extremely low. Therefore the authors consider that Ti is formed by a certain nuclear process in solids.

The experimental results using the multi-layer cathodes are summarized in Table 1. All the samples except EV54 belonged to the multi-layer cathodes, although thicknesses of CaO/Pd layers were different. In the table, σ_x denotes standard deviation of the background for each detector. We judge that excess heat is generated only if it exceeds $3\sigma_H$ of background(Pd-H_2O system). The excess heat is evaluated by the increase of coolant temperature. Details of excess heat and x-ray analyses are described in Ref. 5 and 6.

Both excess heat generation and x-ray emission were observed for all the multi-layer cathodes as shown in Table 1. Input power ranges from 20W to 40W. X-ray emissions were simultaneously detected by X2 and X3 counters located at the upper side of the Pd. Maximum deviations from mean values of X2 and X3 were shown in the table. Neutron emission of 22_{sn} was observed only in the case of EV50.

Elements on the surface A of multi-layer cathode after experiments detected by EPMA(Electron Probe Micro Analysis) are shown in the table. The electrolyte, Pt anode, and Pd contain much more Fe, Cu, Si than Ti. The maximum quantities of them in the apparatus easily exceed the quantities of detected elements on the cathode. Several papers [7-9] report isotope shifts. We apply SIMS (Secondary Ion Mass Spectroscopy) to the detected Fe and show that Fe, at least, can not be explained by contamination.

Mass number ratios (mass ^{57}/mass^{56}) are also shown in the table. For some samples, SIMS analyses were performed at several points. The values of the table were obtained by integrating depth profiles. It is noticeable that all the values of mass57/mass56 on multi-layer cathodes are distributed from 0.036 to 0.66; they are larger than 0.023 which is obtained by Fe standard material.

We should consider the following species as the candidates of mass 54, 56, 57 and 58, because a variety of elements on the cathodes are detected by SIMS.

mass54 : ^{54}Fe, ^{54}Cr, mass56 : ^{56}Fe, $^{40}Ca^{16}O$,
mass57 : ^{57}Fe, ^{56}FeH, $^{40}Ca^{16}OH$ mass58 : ^{58}Fe, ^{58}Ni, ^{56}FeD, $^{40}Ca^{16}OD$

Examples of Depth profile of those mass numbers are shown in Figures 5 and 6. SIMS measurements were performed by MST(Foundation for Promotion of Material Science and Technology of Japan) with Physical Electronics 6600. We see that secondary ion intensity and mass number ratio of EV53 behave anomalously. Especially, mass57/mass 57 reaches 0.8, although natural $^{57}Fe/^{56}Fe$ is 0.023. On the other hand, secondary ion intensity and mass number ratio of EV54 are distributed uniformly, which is a Pd cathode used in a light water experiment. Depth profiles of Fe standard material are similar to those of EV54.

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Table 1. Summary of Multi-Layer Cathode Experiments

Sample	Structure of Cathode	Excess Heat	X-ray	Detected Elements	mass57/ mass56
EV50	Pd 400Å CaO/Pd 1000Å	Generation (max 3.2W)	X1 : Background X2,X3: Simultaneous Detection X2($6.6\sigma_{X2}$),X3($6.2\sigma_{X3}$)	Si, Fe, Cu	0.036 0.038 0.065
EV51	Pd 400Å CaO/Pd 3000Å	Generation (max 1.5W)	X1 : Background X2,X3: Simultaneous Detection X2($6.4\sigma_{X2}$),X3($7.8\sigma_{X3}$)	Fe, Cu	0.24
EV52	Pd 400Å CaO/Pd 1000Å	Generation (max1.9W)	X1 : Background X2,X3: Simultaneous Detection X2($7.6\sigma_{X2}$),X3($8.8\sigma_{X3}$)	Fe, Cu	0.66 0.26 0.22 0.29
EV53	Pd 400Å CaO/Pd 3000Å	Generation (max1.8W)	X1 : Background X2,X3: Simultaneous Detection X2($14.4\sigma_{X2}$),X3($16.6\sigma_{X3}$)	Fe, Cu	0.45 0.37 0.66
EV61	Pd 400Å CaO/Pd 1000Å	Generation (max2.3W)	X1 : Background X2,X3: Simultaneous Detection X2($6.4\sigma_{X2}$),X3($6.7\sigma_{X3}$)	Fe, Au, Cu	0.097
EV54	Pd only (light water)	None ($<3\sigma_H$)	X1,X2,X3:Background	Fe	0.030 0.030
Fe Standard Material		——	——	——	0.023 0.023 0.022

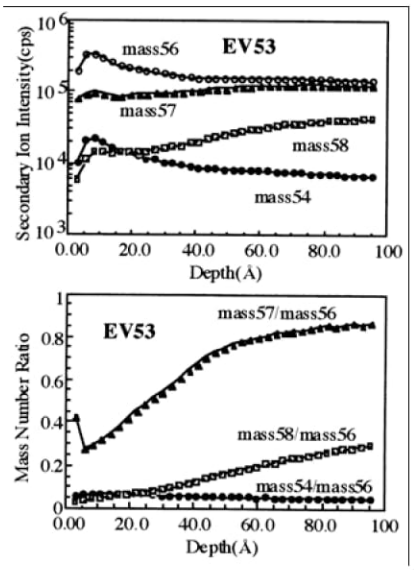

Fig.5 Depth Profiles of Mass Numbers Related to Fe isotopes (EV53:multi-layer cathode)

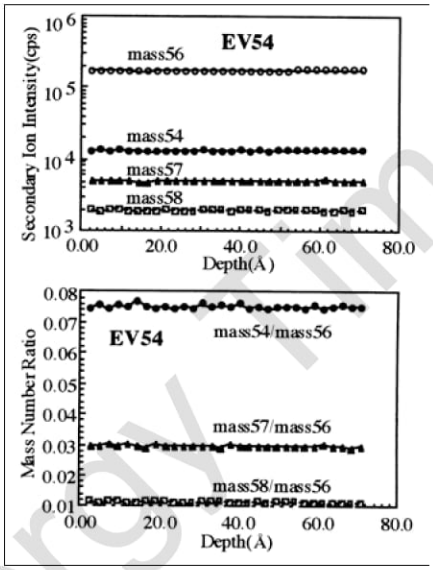

Fig.6 Depth Profiles of Mass Numbers Related to Fe isotopes (EV54:Pd cathode, light water)

Let us consider the relation between mass57/mass56 and $^{57}Fe/^{56}Fe$. If we substitute 0.036 of EV50 into mass57/mass56, we obtain

$$\frac{mass57}{mass56} = \frac{^{57}Fe + ^{56}FeH + ^{40}Ca^{16}OH}{^{56}Fe + ^{40}Ca^{16}O} = \frac{^{57}Fe}{^{56}Fe + ^{40}Ca^{16}O} + \frac{^{56}FeH}{^{56}Fe + ^{40}Ca^{16}O} + \frac{^{40}Ca^{16}OH}{^{56}Fe + ^{40}Ca^{16}O} = 0.036$$

where all the symbols of the elements mean secondary ion intensity. Every term is positive, therefore

$$\frac{^{56}FeH}{^{56}Fe + ^{40}Ca^{16}O} < 0.036 \quad , \quad \frac{^{40}Ca^{16}OH}{^{56}Fe + ^{40}Ca^{16}O} < 0.036 \quad .$$

$$\frac{mass57}{mass56} < \frac{^{57}Fe}{^{56}Fe + ^{40}Ca^{16}O} + 0.036 + 0.036 < \frac{^{57}Fe}{^{56}Fe} + 0.072$$

$$\therefore \quad \frac{^{57}Fe}{^{56}Fe} > \frac{mass57}{mass56} - 0.072$$

If we assume that the effects of Ca are the same as EV50, then $^{57}Fe/^{56}Fe$ of EV52 is larger than 0.15. $^{57}Fe/^{56}Fe$ of EV53 is larger than 0.30.

According to Table 1, we may say that $^{57}Fe/^{56}Fe$ ratios of EV51, 52 and 53 are anomalously large. The large $^{57}Fe/^{56}Fe$ ratio and the anomalous behavior of SIMS data in Fig. 5 indicate that the detected Fe atoms are not produced by normal chemical process. Therefore it is strongly suggested that nuclear reactions occur on the multi-layer cathodes.

References

1. Y. Iwamura, T. Itoh and I. Toyoda, Trans. *Fusion Technol.*, 26, 4T, Part 2, 160(1994)
2. T. Itoh *et al.*, Proc. of ICCF-5, Monte Carlo, Monaco, April 9-13, 1995, p. 189.
3. T. Itoh *et al.*, Proc. of ICCF-6, Toya, Japan, October 13-18, 1996, p. 410
4. Y. Iwamura *et al.*, Proc. of ICCF-5, Monte Carlo, Monaco, April 9- 13, 1995, p. 197
5. Y. Iwamura *et al.*, Proc. of ICCF-6, Toya, Japan, October 13-18, 1996, p. 274
6. Y. Iwamura *et al.*, *Fusion Technology*, vol.33, July, 1998, to be published.
7. T. Mizuno *et al.*, Proc. of ICCF-6, Toya, Japan, October 13-18, 1996, p. 665
8. T. Ohmori *et al.*, Proc. of ICCF-6, Toya, Japan, October 13-18, 1996, p. 670
9. G.H. Miley *et al.*, Proc. of ICCF-6, Toya, Japan, October 13-18, 1996, p. 679.

I place economy among the first and most important virtues, and public debt as the greatest of the dangers to be feared. We must make our election between economy and liberty, or profusion and servitude.
President Thomas Jefferson

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Wang..... Study of Possible Indirect Fusion Reaction in Solids
Wang..... Anomalous Radiation Induced by 1-100 Kev Deuteron Ion Beam Implantation on Palladium
Yabuuchi.... Low-Temperature Nuclear Fusion Outside of Solids
Yamaguchi. Progress Report on the Study of Excess Heat and Nuclear Products by the 'In-Vacuo'Method Run at IMRA Europe
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IRON FROM CARBON AND OXYGEN UNDER ELECTRO-DISCHARGE

K. Sasaki, M. Muraki and T. Nakagawa, Laboratory of Nagaiki, Tokyo, Japan, C. Akbar, Kushi Foundation, Brookline, MA, U.S.A.

Our objective was to confirm the 1960's theory and experiments of George Ohsawa and Michio Kushi for the low-energy transmutations

$$_6C^{12} + _8O^{16} \rightarrow _{14}Si^{28}$$
$$_{26}C^{12} + _{28}O^{16} \longrightarrow (_{26}Fe^{56}, _{27}Co^{59}, _{28}Ni^{59})$$

where the unstable cobalt and nickel are predicted to quickly decay to more stable iron. In 1994 J. O'M. Bockris and R. Sundaresan and, independently, M. Singh et al. reported anomalous iron production from arcing between carbon rods in water. We performed a similar carbon arcing in both water and air and examined magnetic reaction products.

The experiments were carried out in the laboratory of T. Mizuno at the Department of Nuclear Engineering, Hokkaido University, Sapporo, Japan. Our method was to strike an electric arc of 46 volts and 20 amps for five minutes between a carbon rod and carbon powder (>99.97% pure by EDX; 99.9995% by spectroscopy) in a graphite crucible in air. The remaining carbon powder was carefully gathered and found in part to be attracted to a magnet. We analyzed these apparent ferromagnetic products with microphotograph (100x) and EDX analyzer. Under magnification, a brilliant alloy seemed to appear.

Results of EDX analysis of the magnetic reaction powder for four runs of the carbon arcing from 4/14/97 to 4/17/97 yielded production of Fe (40%), Si (30%), Ca (20%), Cu (5%), Zn (2%) and others (3%). This experiment has high reproducibility.

In conclusion, we believe that atomic transmutation happened at low energy and standard atmospheric temperatures and pressures. We suggest mass spectroscopy to analyze isotopic abundances; but the high percentages of iron and silicon in reaction products compared to amounts in the original carbon powder and rods appear to eliminate contamination as an explanation for the results. Reduction of current and voltage, increasing arcing time, and decreasing ambient temperature are predicted to result in higher yields of iron and these should be tested. Our results do seem to confirm the theory of Ohsawa and Kushi and corroborate previous carbon arc experiments.

THE EFFECT OF γ –β PHASES INTERFACE ON H(D)/ Pd OVERLOADING

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In the framework of cold fusion experiments we have studied since 1994, the electrolytic set-up was mainly characterized by a cathode shaped as long wire (pure Pd or Pd alloy). This arrangement was set up

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in order to increase the deuterium concentration along the wire, according to the electromigration formula (Coehn effect):

$$C(x) = Co^{*}e^{(aqV/KT)}$$

The H(D) concentration at the most cathodic end of the wire increases in accordance with rising up the voltage drop and decreasing the *actual wire temperature T*. In order to maximize the parameter V/T, it is necessary to increase the resistance of the wire; long and thin wires (up to 5m long and diameter of only 0.05-0.lmm) are therefore required.

Lasting over three years of experiments, by AC (20KHz) wire resistance measurement method, to evaluate the H(D)/Pd loading ratio *and using an experimental set-up with five intermediate peakup points along the wire, we* found that, according to the electromigration effect, the D loading up is larger in the most cathodic side of the wire; however, after several hours of operations, the loading distribution along the wire generally tends to be reversed: the most loaded section of the wire was *not in the most cathodic zone but in the less one* (the central sides of the wire had intermediate loading). This surprising result, completely different from what was expected according to the Coehn formula, suggests that a sort of "barrier" should exist at the most cathodic side of the wire, capable to prevent, as far as it is effective, the cathode deloading. Elapsing the time, the effectiveness of such a barrier gradually decays. We found that the barrier effect is connected with the different diffusion speed of D into Pd γ and β phases. From this point of view, the wire temperature is important as well because of its effect on the thermal phases stability.

Furthermore, we have some evidence that the Cu connections with external wires for power supply could play a crucial role, probably because of the specific Cu ability in reducing the lattice constant of Pd. We remark that, without a proper barrier, the Coehn effect itself could be deleterious for large loading.

We will report several new procedures (geometric, electronic and chemical), able to make the "Coehn effect" actually effective in order both to reduce strongly the non-reproducibility of the experiments and increase the anomalous excess heat. We note, overall, that the results are qualitatively in agreement with our previous experiments using 'high peak' power pulse electrolysis.

PERIODIC ORDER, SYMMETRY AND COHERENCE IN COLD FUSION

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Solids are distinctly different from plasmas or high temperature environments that are usually associated with conventional fusion. Solids, at room temperature, "do not like" disruption. High temperature plasmas (HTP's) "like" disruption. Periodically, ordered solids can coherently absorb momentum, all at once at a point, discontinuously, and through recoil processes in which the solid, as a whole, moves in response to a collision at an isolated location. As a result, in ordered solids, very often not only is the initial momentum of "colliding" particles *not conserved* by the particles during "collisions," but at low/intermediate temperatures, these kinds of "collisions" play a dominant role in the following important effects: 1. The conduction of heat and electricity[1], 2. Diffraction of neutrons, electrons and x-rays[2], and 3. The Mossbauer effect[3]. Because the idealized limit of stoichiometric PdD is periodically ordered, not only is there reason to believe, as we have discussed previously[4], that further D-loading will result in the occupation of ion band states by D-nuclei, it is probable that the potential nuclear reactions and transport of ion band conserving process involve indistinguishable particles (as in the case of D) and occur completely elastically, distinctly quantum mechanical forms of coherent interment become possible in which periodic order is preserved and it can become "virtually" impossible to identify both the location of the interaction and the participating entities involved with the resulting release of energy[4,5,6]. The paper provides a brief tutorial that summarizes the origin of this interaction, using well-known examples cited from solid state physics, and an overview of the predictions of the associated Lattice Induced Nuclear Chemistry (LINC) theory of Cold Fusion[6].

[1] N. W. Ashkroft and N. D. Mermin, *Solid State Physics*, (Harcourt Brace, Orlando, 1976), Chapter 26.
[2] ibid, pp 364-366. ibid, pp 470-480.
[3] J. Schwinger, *Trans Fusion Tech*, 26, xvi (1994).
[4] T. A. and S. R. Chubb, *Fusion Technology*, 20, 93, (1991).
[5] S. R. Chubb and T. A. Chubb, *Bull of the APS*, 42, #1, 678 (1997).
[6] S. R. and T. A. Chubb, *Fusion Technology*, 24, 403, (1993).

REALLY COLD, COLD FUSION

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A number of results from the Lattice Induced Nuclear Chemistry (LINC) theory[1] of Pons-Fleischmann Cold Fusion (PFCF) become rigorous[2] in the limit of absolute zero temperature (T=0). These include: 1. The bosons-in and bosons-out rule[1] and its generalization[2] (which states that in PFCF only ground-state to ground-state nuclear transitions are allowed), and 2. The requirement that energy and by-product release occur at the crystal boundaries. Although considerable modification in the design of PFCF types of experiments are necessary as T->0, a number of potentially important, additional coherent effects are predicted by LINC that should be observable in this regime. To prove the reality of PFCF-related phenomena, as a consequence, it may be useful to consider conducting modified PFCF-like experiments at low T. In particular, the many-body ion band stat D and ^{4}He populations, which are both bosonic, could both exhibit coherent effects associated with the required sup-conducting (SC) behavior that occurs at T=0. Because the concentrations of theses species are small, it may not be possible to identify direct effects on conductivity from the SC phases of these species. (It should be noted, however, that these kinds of effects could explain the know isotopic anomaly that occurs when D is substituted for H in PdH and the CS transition temperature T_c increases from 9.5˚K to 11.5˚K [4].) On the other hand, SC-induced magnetic phenomena (Meissner and Josephson effects) could be pronounced. Optimal crystal sizes (involving ~ 10^9 unit cells) for supporting coherent effects are predicted by the theory [3]. As discussed in a second abstract [5], it is also possible for coherent interaction to extend beyond the boundaries of individual crystals. These results suggest that optimal geometries consisting of arrays of small crystallites could be used to enhance the magnetic effects and because D is magnetic, magnetic effects from SC behavior could be anisotropic. An overview of these and other "really Cold, Cold Fusion effects" is presented.

[1] S. R. and T. A. Chubb, *Fusion Technology*, *24*, 403, (1993).
[2] S. R. and T. A. Chubb, in *The Sixth International Conference on Cold Fusion Proceedings*, (ea. Okakamoto, NHE Program, Institute of Applied Energy, MITI, Tokyo, 1997), pp 315-318.
[3] T. A. and S. R. Chubb, ibid, pp 417-424.
[4] Wicke, E. and Brodowsky, H., in *Hydrogen in Metals II* (eds Alefeld, G. and Volkl, J.) 73 (Springer, Berlin, 1978).
[5] T. A. and S. R. Chubb, "Deuteride-Induced Strong Force Reactions," abstract this meeting.

DEUTERIDE-INDUCED STRONG FORCE REACTIONS

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The American Physical Society categorizes cold fusion under PACS category 25.45, "Deuteride- Induced Reactions." Fleishmann and Pons cold fusion is better described as due to "Deuteride-induced strong force reactions." Arata and Zhang have shown that the reaction products are ^{4}He and ^{3}He, which are products of the strong force reactions $D^+ + D^+$ Æ $^4He^{++}$ and $D^+ + H^+$ Æ $^3He^{++}$. Ion Band State Theory shows that D^+ and H^+ are subject to reduced Columbic repulsion and that the strong force reaction occurs coherently between ions fractionally occupying unit cells throughout a small volume of ordered lattice. De-excitation of the product state occurs by inelastic scattering between (1) Bloch electrons that are coupled to and screen the band stat ions in a dressed-ion configuration and (2) the balance of the Bloch electrons that constitute the fermi sea within which the lattice ions are embedded. If the screening Bloch electrons are coherent over a larger volume than the Bloch ions, de-excitation energy is distributed over a larger than the D+ ion coherence volume. The main heating effects occur at surfaces and interfaces where periodic order is impaired. The distributed nature of the energy release prevents excitation of compact nucleus and precludes g-ray and energetic particle emission. The very occasionally observed nuclear emissions are presumably due to mechanical disruption of D^+ and H^+ Bloch ion systems.

IN-SITU MEASUREMENT OF TRITIUM CONCENTRATION VARIATIONS DURING PLASMA EXCITATION OF DEUTERIUM LOADED PALLADIUM AND PALLADIUM ALLOYS

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A number (22) of pure palladium samples and palladium alloys have been loaded with a deuterium or hydrogen plasma in a system that allows the in-situ measurement of tritium. By carefully controlling the plasma conditions, the plasma can be constrained to only contact palladium surfaces and to only lightly sputter the palladium. Long run times (up to 200 h) result in an integration of the tritium output and this, coupled with the high intrinsic sensitivity of the system (~ 0.1

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nCi/l), enables the significance of the tritium measurement to be many sigma (>10). In addition to the real time tritium measurement, the deuterium gas can be combined with oxygen at the end of a run, resulting in water samples that were counted in a scintillation counter. The results of these confirmatory measurements of the tritium in these water samples agree quantitatively with the decrease in tritium as measured by the gas ionization gauge. The energy spectrum and the half-life of the radioactive species are also in agreement with the assumption that the material is tritium. Magnetic fields, different types of pulse and RF excitation, and the addition of noble and other gasses have shown some effects that are difficult to reproduce. However, we have continued to investigate the effect of hydrogen additions on the output of tritium in these types of experiments and find that hydrogen additions always suppress tritium production. We will show the difference in tritium generation rates between batches of annealed palladium, as received palladium and the palladium alloys (Rh, Al, W, Co, Cu, Ni, Be, B, Li, Hf, Hg and Fe) of various concentrations to illustrate that tritium generation rate can vary from alloy to alloy as well as within and between batches of the same (ostensibly) alloy. Other metals (Pt, Hf, Ni, Nb, Ta, V, W, Zr) have also been run in the system as background samples and to determine if tritium could be detected in the gas analysis system. In nearly all cases, they have produced results very close to background drift rates.

ENSAP - A SOFTWARE TOOL TO ANALYZE NUCLEAR REACTIONS

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Over the last few years some progress has been made in demonstrating reproducible heat production in so-called *Cold Fusion* experiments. This has not been matched by theoretical understanding as to the mechanism of heat production. It is important to establish which nuclear reactions, if any, are the source of excess heat before speculating on reaction mechanisms. Unfortunately, experiment has not clearly demonstrated the consumption of any nuclear fuel nor production of nuclear ash. So any analysis must be able to cope with incomplete data. A computer is an ideal tool to cope with this problem.

ENSAP is a PC-based program able to analyze reactions of the form:

A + B-> C + D

A, B, C and D are (possibly incomplete) isotope specifications for the reaction products and reactants. Using a database containing nuclear data for all known isotopes, the program displays all reactions satisfying user-specified criteria or conditions. Such criteria include: 1) Energy conservation (reaction should be exothermic); 2) Spin and/or parity conservation; 3) Gamow suppression factors; 4) Optional energy transfer from environment.

LIQUID DROP MODEL FOR EXTREMELY NEUTRON-RICH NUCLEI

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Nuclear energy levels are characterized in part by their isospin quantum numbers. Ordinary nuclides are well described by an independent particle (IP) model with isospins equal to or close to the minimum possible value $|A/2 - Z|$. It has been suggested that extremely neutron-rich nuclei constitute a second branch of the table of isotopes whose ground states have the maximum possible isospin $T_{max} = A/2$ and that neutral members of the T_{max} branch (*i.e.* polyneutrons) serve as mediating particles for the new class of nuclear reactions discovered by Fleischmann and Pons. The energetics of the new reactions have been qualitatively described by a liquid drop model. Recent measurements of the mass spectrum of reaction products produced in the new reactions make possible a refinement of the model, providing an explanation for gaps of instability separating ranges of stability in the mass spectrum.

THE ROLE OF POLYNEUTRONS IN COLD NUCLEAR REACTIONS

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It is well-established that reactions between charged nuclei cannot occur at ordinary temperatures. The situation is different for reactions between a charged nucleus and a neutral particle where there is no coulomb barrier to prevent them from coming close enough to react. Conventional nuclear reactors exploit this situation using neutrons as the neutral particles. However, we know that neutrons do not participate in the new class of nuclear reactions discovered by Fleischmann and Pons (FP reactions) because they are never observed in sufficient numbers.

FP reactions are unlike the ordinary nuclear reactions with which we are familiar. They do not occur between charged nuclei and must be mediated by neutral particles other than neutrons. They are a revolutionary discovery. We should not be surprised if they require a revolutionary explanation. This analysis explores the possibility that the required neutral particles are polyneutrons (groups of neutrons bound together by nuclear forces at densities comparable with those of charged nuclei). Just as neutrons can support a chain reaction in ordinary reactors, polyneutrons are shown capable of supporting a chain reaction in FP reactors.

The existence of polyneutrons implies the existence of a second, extremely neutron-rich branch of the table of isotopes. Ordinary nuclei have isospins equal or close to the minimum possible value abs(A/2-Z). It is suggested that nuclei in the extremely neutron-rich branch, containing polyneutrons as its neutral members, all have the maximum possible isospin A/2.

The energetics of FP reactions are described by a liquid drop model. Recent measurements of the mass spectrum of reaction products allow a quantitative determination of the liquid drop parameters, providing explanation for a wide range of FP effects. The model provides clear-cut predictions of new nuclear reactions and products that permit experimental confirmation or refutation. If confirmed, as seems likely based on its ability to explain so much of what we see, the model will open up a new realm of nuclear physics.

Difficult as it may be to accept the idea of a second, and until now unnoticed, branch of the table of isotopes, an explanation at least as revolutionary as this is required if FP reactions are to be understood and joined with the existing body of nuclear knowledge.

MODELS FOR ANOMALOUS ENERGY TRANSFER

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Motivated by claims of observations of anomalies in metal hydrides, we have continued theoretical investigations into mechanisms that could give rise to anomalous effects. Anomalous effects that have been reported include observations of excess heat, ^{4}He, ^{3}He, tritium, gamma emission, MeV charged particles and neutrons. For any of these effects to be possible, a large quota of energy must be exchanged between the lattice and nuclei within the lattice. Such an effect is presently unknown in solid state physics; if any of the experiments are right, then a pathway for such energy exchange must be present. Moreover, if such anomalous energy exchange is possible, then many of the claimed effects would be predicted to occur.

We have examined the possibility that energy exchange might occur mediated by the strong phonon nonlinearity present upon nuclear close approach in the lattice. The basic idea is that hydrogen nuclei can approach other nuclei at fm-scale distances with low probability. The interaction at close range includes both Coulombic and nuclear contributions, which constitute an exceedingly high order interaction when expressed in terms of phonon operators. Such nonlinear interactions are expected to be able to mediate the transfer of energy on the order of the interaction energy, but with an associated low probability due to the low tunneling probabilities.

We have constructed an idealized condensed matter model for a set of energetic two-level systems that interact with the lattice phonons through high order nonlinearities. With such a model, we can address questions about how such energy transfer might occur, where the energy might go in the lattice and whether cooperative effects (such as Dicke superradiance) can occur. The competition between possible coherent reaction channels and incoherent decays can also be explored with this model.

NUCLEAR SHELL MAGIC NUMBERS AGREE WITH MEASURED TRANSMUTATION BY LOW-ENERGY REACTIONS

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An evaluation is presented for the measured low energy transmutation of metals such as nickel and palladium into numerous other elements, using SIMS and NAA where some of the new elements detected do not have the normal isotopic abundance that would have been seen if they were merely impurities. Up to 10% of the original metal layers were converted into other elements. Following our model, the protons or deuterons in the host metals are considered as an exotic Maxwellian Plasma. We have proposed a "swimming electron layers" mechanism which partially shields the usual nuclear Coulomb repulsion and allows the nuclei to approach each other more closely, thus greatly increasing the rate of long range nuclear reactions. Recent low-energy measurements of the fusion of DD to ^{4}He by Arata et al agree with our previous estimates of the reaction distance of a few pm. This theoretical model is based on a) a low energy nuclear interaction in the eV range contrary to high energy interaction models and b) on non-localized states (exotic plasma state) of the reacting protons or deuterons in contrast to fixed states within the lattice.

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This precludes the attempts of numerous models which try to preserve the status quo by asserting that cold fusion is only hot fusion in disguise. One example is the suggestion that internal cracks in a crystal are produced by the phase transitions. This is not the case as known from the measured DD reaction with very high tritium and helium production compared with neutron generation.

Our analysis of the measured abundance of the new elements results in an exponential law for the transmutation probability N as a yield curve with several maxima as a function of the atomic number Z. This new type of nuclear reaction is similar to pycnonuclear reactions and K-shell electron capture. The nuclear magic numbers are applied to the maxima of N(Z) and we derive a 3^n-law for the ratio of the maxima. This agreement is not a simple numerical speculation but based on the measured exponential increment of Z'=10. This is an expression of a basic consistency of the fully independently gathered experimental results with a well- established fundamental property of nuclei.

To the question how low energy multibody events can occur for generating very heavy nuclei, we consider a three particle interaction as a model for generating very heavy transuranium nuclides which subsequently decay into the very heavy nuclei we have observed. The possibility of three particle interactions is supported also by the following aspect of a nuclear surface force model for explaining nuclei of the known density (H.Hora, *Model of Surface Tension of Nuclei and the Phase Transition to the Quark Gluon Plasma*, CERN-PS-Note 91/05, August 1991). This double layer model referring to the Fermi energy of hadrons also explained how, at six times normal nuclear density, the formation of separate nuclei is inhibited due to the relativistic change of the Fermi energy of the hadrons explaining also the large decay length for the nuclear charge as measured since Hofstadter's work on the subject. Using Lorentzian instead of Gaussian radial profiles for the decay of this nuclear density gives overlapping wave functions for the two nuclei out to distances of pm for transition times in the cold fusion range of minutes to years. On a solid surface then, why should a paired proton and a palladium nucleus not combine with another palladium nucleus? It is at least interesting to note that the following reactions are highly exothermic:

$2\ {}^{106}Pd+p = 2\ {}^{56}Fe+{}^{101}Nb+35\ MeV = 2\ {}^{52}Cr+{}^{109}Rh+23.6\ MeV = 2\ {}^{66}Zn+{}^{81}As+38.3\ MeV$

As an application, we discuss the possibility of adding radioactive atoms to the near surface or interface reaction areas, which may be a low cost method for eliminating long lived nuclear waste and plutonium.

ANOMALOUS HEAT GENERATION OF DEUTERON-IMPLANTED ALUMINUM UPON ELECTRON BOMBARDMENT II

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In a previous paper presented in ICCF-V held in Monaco, one of the authors (K.K.) has reported an anomalous heat generation in deuteron implanted Al upon high energy electron bombardment. In the present paper, the further investigation of the phenomenon will be reported.

Several possible mechanisms of the observed surface melting, such as the heating effects of the electron beam, size effect of the melting point of metals, difference of the depth profiles between implanted proton and deuteron and the possible chemical reactions due to the electron bombardment in deuterium collections were investigated. Nuclear reactions between deuterons were also investigated whether or not the resultant nuclear products are capable of the surface melting.

The necessary energy deposition for a typical melted region is about 160MeV. This is nearly 10^5 times that of the energy loss of the impinging 175KeV electron beam through the Al foil. From numerical calculation of the energy deposition upon the surface layer due to the kinetic motion of the deuteron or deuterium in the collection, we obtained that mean kinetic energy of roughly 100eV for each deuteron or deuterium molecule is enough to produce the observed surface melting. This amount of energy is, however, too large for any kind of chemical reactions, but on the contrary, too small, presumably, to attribute the phenomenon to the result of nuclear reactions.

These results will be supplemented with further theoretical and experimental investigations.

EXCESS HEAT REGISTRATION (UP TO 200 W) IN D_2 AND H_2 HIGH CURRENT DENSITY GLOW DISCHARGE WITH VARIOUS CATHODE MATERIALS

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The registration of input electrical power and output heat power in experiments with a high current Glow Discharge was carried out using a device - flowing calorimeter [1]. The input electrical power was defined by integration of product of operating meanings of a current and voltage. The output heat power was defined by summation of heat powers of the cooling cathode, an anode and a chamber calorimeter. The system of Date Acquisition was used on the base of DAS-1400 and CTM-05 boards, and IBM PC computer. The initial processing of electrical parameters was made using analog precise boards with the time resolution more 1MHz. The absolute calibration of heat registration system was carried out using resistive heaters, which gave precise values of power. A special resistive heater, which was set up instead of the Glow Discharge device, was used for control tests of the thermal balance registration system. The total error of measurements of Excess Heat (according to the tests) does not exceed 3%.

The special pulsing periodic power supply, the special cathode sample design and way of its installation (using the concepts of the phonon laser theory) were used in experiments. This technology of the experiment has allowed to receive excess heat with reproducibility of 100 % and to make comparative experiments for various systems: a material of the cathode sample - plasma forming gas (D_2, H_2).

The maximum value of excess heat (up to 31W at EFFICENCY 150%) is received for Pd-D system. The high value of Excess Heat are registered for the following systems: (Ti-D, 17W); (Ta-H, 15W); (Ta-D, 12W); (Nb-H, 12W); (V-D,11W); (V-H,12W). The low value of excess heat (3-5W) are observed for systems Pd-H, Zr-H, Ti-H, Nb-D. Excess Heat is very small (1-l,5W) for Zr-D. The long registration of excess heat (during 150 hours) for one Pd sample in D_2 was carried out in a mode of cycles (23 switch off and switch on). These tests have shown 100% reproducibility of Excess Heat production at the level of 10W with a deviation of (±3 W (EFFICENCY - 130 % (±5 %). The value of Excess Heat decreased monotonously by 20% to the end of the experiment.

Demonstrating Glow Discharge device of multielement was created using the results of these researches. Four cathodes - anodes pairs are placed in a vacuum chamber with volume of 350 cm^3 and had a feed from the transistor power supply. This Glow Discharge device has shown Excess Heat more 200W at EFFICIENCY of about 150%.

1. A.B. Karabut, Ya.R. Kucherov, I.B. Sawatimova, "Excess Heat Measurements in Glow Discharge Using Flow 'Calorimeter-2,'" *Proc, of the 5th International Conf on Cold Fusion*, April 9-13, 1995, Monte-Carlo, Monaco, p. 223-226.

REGISTRATION OF IMPURITY ELEMENTS PRODUCTION WITH CHANGED ISOTOPES: A NATURAL RATIO IN CURRENT DENSITY GLOW DISCHARGE

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In the assumption that registered excess heat [1] is connected to proceeding nuclear reactions [2], the analysis of the impurity contents in the cathode samples material before and after experiments using Glow Discharge device flowing calorimeter was made. The methods were used: secondary ion mass - spectrometry (SIMS), secondary neutral mass - spectrometry (SNMS). The method for the impurity determination included the following operations: removal of the top layer (probably a polluted layer with the thickness of 15 angstrom using the plasma etching method; taking off and analyzing of the first layer with the thickness of 50 angstrom (scan 1); taking off and analyzing of the second layer with the thickness of 50 angstrom (scan 2); plasma etching of the cathode samples (removal of the material layer with the thickness of 1000 angstrom); taking off and analysis of the third layer with the thickness of 50 angstrom (scan 3), taking off and analysis of the fourth with the thickness layer of 50 angstrom (scan 4). This technique was used for the analysis of the cathode sample before and after the experiment. The difference of impurity quantity before and after the experiment was determined as production of elements in the experiment. These researches have shown that production of the impurity nuclides occurs in the volume of the cathode sample in a superficial layer up to 0,1 microns. The greatest production of the impurity nuclides in Pd matrix and change of their natural isotope ratio is registered for the cathode sample as "phonon resonator" (submitted to Dr. Kucherov, ENECO). The impurity of elements with mass less than Pd mass approximately twice and with mass close to Pd mass are registered in number up to a few tens of percents. In this sample, change of a natural ratio of isotopes in the top layer of Pd is observed. The change of a natural ratio of isotopes in a few tens of times is received for some impurity elements (Ca, Ti, Fe, Ni, Ge and other). The absence of some basic (with large % by the contents in a nature) isotopes of impurity elements was registered. There is the absence of the following isotopes of ${}^{58}Ni$, ${}^{70}Ge$, ${}^{73}Ge$, ${}^{74}Ge$, ${}^{113}Cd$, ${}^{116}Cd$. The production of impurities rare

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earth nuclides ^{146}Nd, ^{152}Sm, ^{153}Eu, ^{163}Dy and ^{185}Re was registered after the experiment for Ta cathode sample. These results have high reproducibility. Scheme of nuclear reactions realization [2] can be used at the analysis of these experimental results. Estimating the value of nuclear reaction of 3-10 MeV, the value of heat energy registered in the experiment per one cathode sample [1] will be corresponded with the quantity of received impurities of stable nuclides [2].

[1] A. Karabut, "Excess Heat Registration (up to 200 W) in D_2 and H_2 High Current Density Glow Discharge with Various Cathode Materials", Extended Abstracts, ICCF7 (1998).
[2] A.B. Karabut, Ya.R. Kucherov, I.B. Sawatimova, "Possible nuclear reactions mechanisms at glow discharge in deuterium," *Frontiers of Cold Fusion, Proc, of the 7hird International Conf, on Cold Fusion*, October 2 1 -25, 1992, Nagoya, Japan, p. 165.

RESEARCH OF PENETRATING RADIATION IN CURRENT DENSITY GLOW DISCHARGE

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The research of penetrating radiation in experiments with a high current density Glow Discharge was made using various types of detectors and an x-ray film. The special pulsing periodic power supply, the special design of the cathode sample and way of its installation (using the concepts of the phonon laser theory) were used in experiments. This technology of the experiment has allowed to receive generation of penetrating radiation at the level of 10^5 -10^7 1/sec with the reproducibility 100%. The results of use of a neutron 3He detector with the multichannel analyzer of spectrum and a monitor have shown that the signals in experiments are on a neutron signal, but they are not neutrons. The intensity of radiation changes up to 10^4 times at change of cathode sample material and plasmaforming gas. The penetrating ability (energy of radiation) has correlated dependence on energy of nuclear levels of the cathode sample material. The multiplication of radiation by a factor of 2 -2,5 is observed at the installation of the lead screen with thickness 50 mm between the cathode and the detector. Presumably, the effects of biological influence of penetrating radiation on a human were observed in this run of experiments.

The results of penetrating radiation registration using other types of detectors and an x-ray film can be interpreted as follows. We register ultrashort (10^{-11} -10^{-13} sec) monoenergy beams fast electrons with energy up to several MeV and accompanying microwave radiation. Probe measurement allow to estimate number (10^9-10^{13}) of electrons in a beam.

The weak radiation of this type (up to 10 -10^2 1/see) is observed after switch off discharge during time from several minutes up to several hours. It is possible to assume the existence of metastable excitation levels with the energy higher than several keV in solid with large life time.

These results show that the channels of nonlinear transformation of low energy of 10^2-10^3 eV of plasma ions in to high energy of 10^4-10^6 eV of electrons are realized to the solid cathode sample. This fundamental physical phenomenon is observed for all metals and plasma forming gases.

The received experimental results are according to the theoretical ideas of professor P. Hagelstein [1].

1. P. Hagelstein, "Lattice-Induced and Nuclear Reactions," *Proc. of the Fourth International Conf . on Cold Fusion*, December 6-9, 1993, Hawaii, USA.

ANOMALOUSLY ENHANCED D(d,p)T REACTION IN PdO OBSERVED AT VERY LOW BOMBARDING ENERGIES

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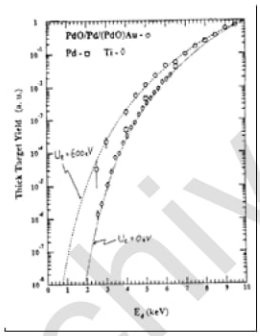
We have started a series of measurements of the D(d,p)T reaction in metal with the bombarding energies down to 2 keV, in order to investigate whether the reaction rate in metal is really enhanced or not. Previous results on Ti and Yb [1,2] clearly show that the the reaction rate is enhanced in metal and depends on the kind of host metal. However, the enhancements obtained for both metals are so small that no nuclear reactions can be observed at room temperature.

Recently, we studied the D(d,p)T reaction in Pd and PdO. Foils of PdO/Pd/Au (50 um in thickness) [3] and of Pd (200 um in thickness) were used as targets. For the PdO/Pd/Au foil, electrolysis was carried out as reported in [3] pior to the bombardment in order to charge deutrium. The targets were cooled at about -160°C during the bombardments. For the PdO/Pd/Au bombardment, deuterons stop in the PdO layer of about 50 nm thickness. Protons emitted in the D(d,p)T reaction were measured with a ΔE-E counter telescope consisting of Si surface bamer detectors. The yield at E_d= 10 keV were measured frequently during the run, and the yield of each energy was normalized to the yield at 10 keV.

In the right Figure, we show thick target yields of the D(d,p)T reaction in PdO (O), Pd(≠) and Ti (◇) against bombarding energy. The yields for PdO are surprisingly larger than those for Pd and Ti. The dotted curve shows a thick target yield calculated with the bare reaction cross section, which corresponds to the reaction without enhancement. For PdO, the calculation completely fails to reproduce the data; about 50 times smaller than the datum at 2.5 keV! To interpret the enhanced reaction, a screening potential (U_e), which reduces the Coulomb barrier between two deuterons, is naively introduced. A dashed curve which reproduces the PdO data very well is a calculation with U_e = 600 eV. This is very significant, since a simple extrapolation of the reaction rate allows us the cold fusion. Thus, it is highly desirable to investigate the origin of the anomalously enhanced reaction rate observed in this work.



[1]. H. Yulci, *et al., J. Phys. Soc.* Jpn. 66 (1997) 73.
[2] H. Yuki, *et al., J. Phys. G Nucl.* Part.Phys. 23 (1997) 1459.
[3] A.G. Lipson, *et al., Proc. of ICCF-6* (1996), Vol. 2, p. 433.

NUCLEAR ACOUSTIC RESONANCE AMPLIFICATION

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Nuclear acoustic resonance (NAR) is the interaction of nuclear hyperfine levels with AC electric field induced by solid state lattice oscillations (phonons) [1]. When a strong magnetic field is applied to such a system, it can reach a resonance, when magnetic field energy is lost or gained. A change in magnetic field can be detected, allowing to measure the coupling line width, etc. It is known that the presence of a stable charge vacancies in TaH lattice results in the anomalous NAR effects [1]. To get this anomaly, the lattice must have two components - light and heavy sublattices. The nucleus does not have a dipole electric moment in its ground state, but some of the nuclei have quadrupole moment, which can interact with phonons. Normally the light sublattice has higher phonon frequencies and heavier nuclei can have larger quadrupole moment, which are the preferences for NAR. The lattice also must have stable charge vacancies.

NAR effect is one of the few realistic ways to excite a nucleus with a low energy interaction. To do that the effect must be amplified. There are a lot of obstacles on this path. The most prohibitive are magnetic decoupling and a modified form of the Anderson's Localization Theorem [2]. The first problem can be dealt with by orienting nuclear spin in a DC magnetic field. The second one requires extremely strong phonon mode to allow lattice/nucleus energy transfer. The ways to create a strong phonon mode using phonon focusing effects are discussed in the present paper.

If all the conditions are met, semiclassical calculations give energy transfer rates of up to 10^5 eV per nucleus, exceeding possible decoupling mechanisms rates, except for the nuclear events. The quantum mechanics model of this effect is too complex and so far was not successful.

[1] D.I. Bolef, R.K. Sundfors. *Nuclear Acoustic Resonance*. Acad. Press, 1993.
[2] F. Ausel. In: *Radiationless Processes*, NY, Plenum Press, 1979, pp. 250-289.

NEW MEASUREMENT OF EXCESS HEAT IN A GAS-LOADING D/ PD SYSTEM

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As reported in ICCF-6, the excess heat has been observed in a gas-loading D/Pd system in terms of the comparison between a pair of twin systems. The temperature of the D/Pd system is always higher than or equal to that of a H/Pd system while there is essentially no power input into these twin systems. It can be explained as an evidence of excess heat in the D/Pd system if the heat transfer coefficients are essentially the same for these twin systems. Some questions were raised about the measurement of heat transfer coefficients. Because the heat conductivity is known to be smaller in deuterium gas, one may expect a smaller heat transfer coefficient in a dewar filled with deuterium gas. One way to solve this problem is to conduct the excess heat measurement in a single dewar filled with deuterium gas only instead of twin systems. That is what we have done after ICCF-6 in the same apparatus. There are no electrodes or electrolytes for electrolysis. The gas-loading process is completed with no high pressure and cryogenics because a tungsten filament is heated to dissociate the hydrogen molecules. The unique feature is to maintain a high loading ratio after the fil-

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ament is turned off in a dewar system, which contains a long palladium wire (0.234 cm^3), and has a low heat - transfer coefficient (0.1W/˚C).

The temperature of the D/Pd gas-loading system(T_D) is carefully monitored every 60 seconds for more than one month while the bath temperature(T_B) is monitored in parallel as well. If there is no excess heat, when the bath temperature is higher than that of the D/Pd system, the temperature of the D/Pd system increases; when the bath temperature is lower than that of D/Pd system, the temperature of the D/Pd system decreases, because the D/Pd system is immersed in this bath tank. Consequently, the temperature of the D/Pd system must be equal to the temperature of the bath temperature at the points where the temperature of the D/Pd system takes its maximum or minimum value. This behavior was observed indeed in our experiment. However, we have also observed that the temperature of the D/Pd system increases while its temperature is higher than that of the bath. This is a very strong evidence showing the excess heat in the D/Pd system, because it is based on the Second Thermodynamic Law.

The highest temperature difference of (T_D -T_B) was 3.8˚C, and lasted more than 14 hours. It corresponds to an excess power of more than 1 W/cm^3 in palladium wire. We are currently searching for the condition (loading ratio, temperature, cooling rate, etc.) in order to keep this excess heat behavior for a longer period. If we are able to succeed in keeping this amount of excess heat for more than one month, or we are able to increase this excess power, there will be an opportunity to show that this excess heat is from non-chemical sources.

The gas-loading system has the features of safety (no explosive gas-mixture), economy (no deuterium gas released), and high Carnot efficiency (no constraint from the boiling temperature of electrolyte) as a future energy source; it also has the advantage of essentially no power input (good for excess heat measurement), and less contamination (good for nuclear transmutation test). This is why our gas-loading experiment has continued for more than seven years. The detail of the gas-loading method will be discussed in conducting this series of experiments.

SELECTIVE RESONANT TUNNELING MODEL FOR LOW-ENERGY INDUCED NUCLEAR REACTION IN SOLIDS *(I)—ANALYSIS OF THE FAILURE OF THE "EXCESS HEA T " EXPERIMENTS IN TERMS OF "FINE TUNING" PARAMETER*

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Selective resonant tunneling model has been proved to be useful in explaining the low-energy induced nuclear reaction in solids and in guiding the experimental search for excess heat. The only assumption in this model is the existence of an energy level in the deuteron-deuteron nuclear well with a very narrow width, and this assumption is supported by the experiments of "Heat after Death" and "Heat after Life." After the ICCF-6, three major steps have been made in developing this theoretical model. These are: (l) analyzing the failure of NHE in reproducing "excess heat", (2) including the low-energy induced nuclear transmutation in this model and (3) comparing with the spin resonant tunneling phenomenon which has been well identified as the resonance between very narrow energy levels.

The resonant tunneling model was first proposed in ICCF-5 to explain the major feature of the cold fusion phenomenon (i.e. - excess heat without commensurate neutron and Gamma radiation). However, there was a question of "fine tuning." How can we tune on such a narrow resonant energy level? In ICCF-6 a "fine tuning" mechanism was proposed to answer this question. Indeed, the D/Pd system may keep itself in a resonant state if the cooling rate is not too strong and if the density of states in solid is decreasing with the energy.

During ICCF-7, it was claimed that the NHE-FCS could not reproduce the excess heat observed in the Fuel Cell Type Electrolysis System. However, having looked at their calorimetry in detail, we have found the salient difference between the NHE-FCS and the Fuel Cell Type Electrolysis System. In the view of the "fine tuning" mechanism there is a key parameter to describe the capability of keeping itself in resonant tunneling state. That is the ratio of the volume(V) of palladium cathode to the heat transfer coefflcient(k) (*i.e.* V/k). Since same electrodes were used in NHE-FCS and in the Fuel Cell Type Electrolysis System, the volume of the palladium is supposed to be the same for both systems (V≈ 0.188cm^3). The difference in heat transfer coefficient is evident — the k≈0.75W/˚C in the NHE-FCS, and k=0.1 W/˚C in the Fuel Cell Type Electrolysis System. Based on the experimental data in the past seven years, if Òfine tuning" parameter, V/k, is greater than 0.6 cm^3˚C/W, there would be a positive excess heat effect. Consequently, the D/Pd system in NHE-FSC might lose its capability in keeping itself in resonant tunneling state. The "fine tuning" parameter for NHE-FSC is V/k≈0.25 cm^3.˚C/W, and V/k= 1.88 cm^3.˚C/W for the Fuel Cell Type Electrolysis System. It is understandable that there is no excess heat observed in NHE-FCS and the excess heat was observed in the Fuel Cell Type Electrolysis System. The same analysis was applied to Kunimatsu's experiment in IMRA. The "fine tuning" parameter, V/k≈0. 18 cm^3.˚C/W for their mass-flow calorimeter, and V/k≈l .16 cm^3˚C/W for the isoperibolic calorimeter, respectively. Indeed the NHE and IMRA reproduced the Australian experiment (Green and Quickenden in 1994-1995), where the "fine tuning" parameter was as small as 0.0354 and the excess heat effect was proved to be within the experimental error, although they were using isoperibolic calorimeter. It suggests that greater palladium volume and less flow rate of cooling water might reproduce the excess heat even if in the NHE-FSC.

NUCLEAR EMISSIONS IN Au/ Pd/ PdO:D(x) SYSTEM INDUCED BY EXOTHERMIC DEUTERIUM DESORPTION

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It was shown earlier in experiments being carried out in Russia (Institute of Physical Chemistry of RAS Lebedev Physics Institute of RAS) that exothermic deuterium desorption from Au/PdJPdO:D (D:PdO/ PdJPdO:D) - heterostructure is accompanied by emissions of neutrons, gammas & charged articles (protons and alphas). The emissions were observed in air conditions in the process of D-desorption stimulation after electrochemical loading of a thin hetrostructure sample (0.002 - 006 cm thickness) in 1M - NaOD solution in a heavy water. The samples used were produced in IPC RAS from vacuum annealed Pd foils, oxidized in an oxygen flame (PdO thickness within 20 - 50 nm) and had on one side an electrodeposited layer of Au.

To test nuclear results in such a kind of system, the experimental set up has been designed based on high vacuum NHE-facility. Nuclear measurements have been conducted using simultaneously 2 SSB detectors, 2 Cd Te - X-ray detectors, gamma HPGe & NaI detectors. The neutron measurements were carried out in air atmosphere with the help of detector consisting of 2 independent big NE - 213 counters with total efficiency of about 8%. The initiation of D-desorption from the sample has been provided by both heating and self-deformation (strain) in the vacuum chamber as well as in air atmosphere.

The neutron-charged particles and X-ray spectra from the Au/Pd/PdO samples loaded with deuterium have been obtained and studied. The charged particles spectra consist of two peaks: the first with position ~ 1.5 MeV and second, broad within 4 - 6 MeV. The peak between 1 - 2 MeV is attributed to protons from dd-reaction, taking into account an energy loss during their escape from heterostructure. The broad peak in a high energy interval (4 - 6 MeV) possibly is a signature of a multibody dd-reaction. The process of charged particles emission in vacuum in some cases was accompanied by X-ray emission, possibly Au - K alpha line.

In the neutron spectra the peaks located near the 2.5 (for both independent detectors) and between 4- 5 MeV interval are obtained.

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CHANGE IN THERMAL NEUTRON CROSS-SECTION FOR Pd AND Cu - CATHODES DURING THE ELECTROLYSIS UNDER IRRADIATION BY A WEAK THERMAL NEUTRON FLUX

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The spectrum of gamma emission generated during electrolysis of copper cathode in the light water electrolyte has been studied. Two sorts of Cu have been used: 1) nominally pure Cu - foil (cold-rolled) with purity 99.9% and 0.2 mm thickness; 2) hard commercial copper (cold-worked) doped with 0.14% Si, 0.3 mm thickness. The 1-M solution of KOH in a light water was used as an electrolyte. Anode was Pt-plate. The gamma-spectra detection has been carried out with pure Ge detector, having energy resolution of about 2.0 keV. To create neutron flux, the Cf-252 neutron source with intensity of about 2 * 10^3 n/s in 4 pi solid angle has been used. For the thermalization of neutrons inside electrolytic cell, all are set up with detector surrounded by about one metric ton of moderator (polyethylene and water).

The experiments showed that during electrolysis of Cu (1) under thermal neutron irradiation there were no excess gamma emission in all spectral intervals within the energy 0.1 - 5.0 MeV. For Cu samples (2) and (3) some increase of gamma counting rate in the foreground runs was detected within the energy interval 1031-1047 keV that corresponds to Cu-66 1039 keV gamma peak's position. Simultaneously, the decrease of 2.225 MeV peak due to thermal neutron capture by hydro-

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gen has been observed.

On Fig. 1,2 (ed. note: not shown here) the results of background subtracting from foreground counts are presented within the energy interval that corresponds to 1039.4 keV peak location. For foreground runs with duration (electrolysis time) less then 5000 s the positive significant effect (ΔN) = (130 ± 035) $^{\circ}10^{-3}$ c / s has been obtained with appearance of peak having position close to 1039 keV (Fig. 1). In the same time for long foreground runs (t > 12000 s) the negative result was established (Fig. 2). These data confirm that the peak near the 1039.4 keV position is really a signature of Cu-66 generation (because the half-time for Cu-66 is about 5.1 min).

The effect of Cu-66 generation (with the total mean rate v = 1.70 at. Cu-66/s) is connected with increase in thermal neutron's capture cross-section of copper (decrease in 2225 keV line intensity in foreground runs) during electrolysis under the thermal neutron irradiation.

The similar experiments with 100 micron thickness Pd foils in 1M-NaOD electrolyte have been carried out and showed significant increase in thermal neutron cross-section for these foils during electrolysis. The result obtained will be discussed.

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RADIATION MEASUREMENTS AT CHINA LAKE: REAL OR ARTIFACTS?

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Anomalous radiation at China Lake was first detected by the exposure of dental X-ray films in two experiments producing excess power [1]. There was no exposure of the film used in a control study during these experiments. There was also no exposure of similar films in more than 20 experiments where no excess power was present.

Anomalously high radiation counts were observed using several different Geiger-Mueller (GM) detectors as well as a sodium iodide (NaI) detector when electrolysis experiments using heavy water were in progress. These high radiation counts were often observed in co-deposition experiments where palladium metal is deposited from a D_20 solution onto a copper cathode in the presence of evolving deuterium gas. The anomalous radiation counts reached valves as high as 73 sigma above normal background counts [2]. Most experiments, however, gave normal radiation counts. No anomalous count rates were ever observed when experiments were turned off. There was always a decrease in the anomalous radiation when the detectors were moved away from the electrolysis cells. There was no observable change in the anomalous radiation when the scalar ratemeters used in these experiments were switched to battery power and disconnected from the electrical lines. Finally, the appearance of the anomalous radiation always correlated with the expected time periods required to load the palladium with deuterium. For example, the anomalous radiation would appear within a few hours in the co-deposition experiments where the palladium is loaded with deuterium as it deposits from solution. In contrast, the appearance of anomalous radiation required days of electrolysis for the palladium rods that load much slower.

The question whether these anomalous radiation measurements are real or experimental artifacts stems from the fact that two similar detectors often gave different results in monitoring the excess radiation. One GM-detector would measure anomalous radiation while another GM-detector would be "blind" to any anomalous effect. A few experiments, nevertheless, gave simultaneous anomalous effects from two different radiation detectors.

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1. M.H. Miles, R.A. Hollins, B.F. Bush, J.J. Lagowski and R.E. Miles, *J. Electroanal. Chem., 346, 99* (1993).
2. M.H. Miles, B.F. Bush, and K.B. Johnson, "Anomalous Effects in Deuterated Systems," NAWCWPNS TP 8302, September, 1996.

ENERGETICS OF NUCLEAR TRANSMUTATIONS DURING THIN-FILM ELECTROLYSIS

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Prior electrolytic cell experiments [1-3] using thin-film (~500-2000Å) metallic coatings identified a number of possible nuclear transmutation products following a several week run. Products with high concentrations were generally localized in four mass ranges covering A ~ 20-35; 50-80; 105-130 and 190-210 (3). The excess heat measured during these runs was typically low for single coatings (≤0.5 W) and higher for multiple coatings. To explore the reaction energetics, results from runs using Ni, Pd and Ti coatings are examined in the context of RIFEX theory (3). The reactants are assumed to involve (p + metal film) reactions, forming short-lived intermediate nuclear "complex" states. These intermediate states then decay by a "slow" fission process creating the observed array of products. An overall energy balance is obtained by calculating the total binding energy associated with the measured product yields, less the total binding energy associated with the reactants, assuming conservation of nucleons. Assuming reacting p/metal atomic ratios of 0.5 to 1.0, the calculated output powers for the three coatings cited are in reasonable agreement with the experiment, especially considering the various error limits in the experimental measurements. This result corresponds to an excess energy of about 104-105 eV metal atom reacted—also in reasonable agreement with a 2 x 10^4 eV/Pd reported by Arata (4), but are higher than the 300 eV/Pd reported for typical Pons-Fleishman-type experiments (5).

While the agreement of the overall RIFEX reaction energetics with our prior thin-film experiments using a variety of coatings is encouraging, an unambiguous confirmation of the mechanism involved requires additional benchmarks. Other relational aspects between theory and experiment include the characteristic mass ranges for high yield elements and the predominance of stable isotopes. These phenomena plus other characteristic reaction "signatures" will be discussed in terms of RIFEX theoretical predictions.

1. G. H. Miley and J. A. Patterson, "Nuclear Transmutations in Thin-Film Nickel Coatings Undergoing Electrolysis," J. *New Energy 1*, Vol. I, pp. 5-30 (1996).
2. G. H. Miley et al., "Quantitative Observation of Transmutation Products Occurring in Thin-Film Coated Microspheres During Electrolysis," *Progress in New Hydrogen Energy*, (Ed., M. Okamoto), Vol. 2, pp. 629-644 (1997).
3. G. H. Miley, "Possible Evidence of Anomalous Energy Effects in H/D-Loaded Solids—Low Energy Nuclear Reactions (LENRs)," Proceedings, *Breakthrough Propulsion Physics Workshop*, NASA Lewis Res. Ctr., Cleveland, OH, (August 12-14, 1997).
4. Y. Arata and Y.C. Zhang, "Solid-State Plasma Fusion," *High Temp. Society*, Vol. 23, pp. 1-56 (1997).
5. M. Fleischman, S. Pons, M. W. Anderson, L. J. Li, and M. Hawkins, "Calorimetry of the Pd-D20 System," J. *Electroanal. Chem.*, Vol. 287, pp. 293-348 (1990).

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QUANTIFICATION OF ISOTOPES USING COMBINED SECONDARY ION MASS SPECTROMETRY AND NEUTRON ACTIVATION ANALYSIS

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Thin-film metal coated microspheres have been processed in the Patterson Power Cell™ and analyzed for possible nuclear transmutation products [1-3]. Various metal coatings (Ni, Pd, Ti, etc.) employed were within 500-2000Å thick and required high precision analytical techniques to characterize the yields and isotopes in the base coating prior to and after a run.

A combination of Secondary Ion Mass Spectromety (SIMS) and Neutron Activation Analysis (NAA) was selected for analysis. The NAA requires irradiation and counting of a calibration standard in parallel with the test sample for every isotope. Thus it is time-consuming and was limited to measurement of select elements where standard procedures had previously been developed to give high degrees of trace concentration. SIMS with ultra low detection limits could detect all the known isotopes in a sample relatively rapidly, but giving relative concentrations and isotope ratios more precisely than absolute values. NAA, with comparably low detection limits (~0.1 ppt at best) offers immunity from matrix effects and provides a measurement of bulk quantities vs. the local characteristic of SIMS. To calibrate the SIMS sensitivity, results were correlated (employing an empirical relative sensitivity factor (RSF) approach) with the measured NAA yields.

The SIMS typically probes an area of 125 μm x 125 μm, but the bead surface area is three orders of magnitude larger, necessitating a statistical approach. In addition, an image quantification approach [4] is being applied to average over variations in isotope concentration. A separate problem involves isotope fractionation which can distort the isotope shifts (SIMS vs. Natural) up to 4% for the light elements and to 1% for the heavier elements [5]. However, for example in Ti film fun, about 51 isotopes have statistically significant deviations from natural and are

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not within the uncertainty due to isotope fractionation effects. Also the measured increase in concentration of isotopes/elements after the run can not be explained in terms of known impurity sources or chemical effects, even considering statistical uncertainties [1-3].

1. G. H. Miley and J. A. Patterson, "Nuclear Transmutations in Thin-Film Nickel Coatings Undergoing Electrolysis," *J. New Energy* 1, Vol. 1, 5-30 (1996).
2. G. H. Miley *et al.*, "Quantitative Observation of Transmutation Products Occurring in Thin Film Coated Micrsopheres During Electrolysis," Progress in New Hydrogen Energy, (Ed., M. Okamoto), Vol.2, 692-643 (1997).
3. G. H. Miley, "Possible Evidence of Anomalous Energy Effects in H/D-Loaded Solids-Low Energy Nuclear Reactions (LENRs)," Proc., Breakthrough Propulsion Physics Workshop, NASA Lewis Research Center, Cleveland, OH, August 12-14, (1997).
4. Morrison, G. H., SIMS III. Proc. 3rd Int. Conf., Budapest, 244-250 (1982).
5. Shimizu, N. and Hart, S. R., "Isotope Fractionation in Secondary Ion Mass Spectrometry," *J. Appl. Phys.*, 53(3), 1303 (1982).

MEASUREMENTS OF TRANSMUTATION ELEMENTS ON SEVERAL METALS BY STRONG CATHODIC ELECTROLYSIS IN HEAVY WATER SOLUTION

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Many elements on Pd, Pt, Zr and Au electrodes were confirmed by several analytic methods after long-time electrolysis in heavy water solution. For example, the reaction products on a Pd cathode with the mass number up to 208 are deposited were subjected to electrolysis in a heavy water solution at high pressure, temperature and current density for prolonged time. Extraordinary observations were the changes of their isotopic distributions in the produced elements; these were radically different from the natural ones on the Pd electrode. It means that a nuclear reaction had taken place during the electrochemical treatment. It is suggesting that a role of new interactions working between a proton and an electron should explain the new phenomenologies that are experimentally observed in this study.

These masses were composed of many elements ranged from hydrogen to lead. The elements were changed by metal and electrolysis conditions. For example, natural chromium is 4.3% Cr50, 84% Cr52, 9.5% Cr53 and 2.4% Cr54. But the chromium found on the Pd surface was 14% Cr5O, 51% Cr52, 2.4% Cr53 and 11% Cr54. Natural isotopic distribution varies by less than 0.003% for Cr. Essentially the same phenomenon was confirmed more than ten times with high reproducibility at high cathodic current density, above 0.2 A/cm^2. All the possibilities of contamination had been carefully eliminated by several pretreatments for the sample and electrolysis system. It may be concluded that a reaction can be taken during the electrochemical reaction.

THE CONFIRMATION OF NUCLEAR TRANSMUTATION PHENOMENON IN A GASLOADING H/ PD SYSTEM USING NAA (NEUTRON ACTIVATION ANALYSIS)

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Phenomenon of nuclear transmutation in a gas-loading Pd/H(Pd/D) system has been studied for a long time by us [1]. In the past several years, we concentrated our attention to search charged particles, precursors and got some positive results [1]. But, it is difficult to repeat them every time. Recently we concentrated our attention upon nuclear transmutation of metal Pd in Pd/H system [2]. Through a long-term treatment, nuclear transmutation happened in Pd of Pd/H system. For confirmation of it, a lot of experiments have been done. This paper reports about using NAA methods to confirm the nuclear transmutation phenomena.

Six Pd samples were tested. No.1,3,4,5 came from Pd/H system. No.2 is original Pd. No.6 is pure zinc. The weight of each sample is about 10mg. Each sample was cleaned and sealed in a small quartz ampoule, respectively, then, put into reflector of Tsinghua University pool reactor where the thermo-neutron fluence is 10^{12}n/sec cm^2. They were irradiated for one and a half hours, then were taken out from reflector and cooled for 72 hours. Their activity were measured with pulse-height (energy) spectroscopy with a HPGe Gamma Ray detector produced by EG&G ORTEC. The results are shown in Table l.

Table 1. Activities of ^{65}An and ^{69m} Zn

sample	area of ^{65}An (1.1155MeV)	area of ^{69m}Zn(4387KeV)	ratio of area
No. 1	267 ± 16(counts)	143 ± 12(counts)	1.867
No .2	0	0	
No. 3	1157 ± 34	245 ± 16	4.722
No. 4	849 ± 29	537 ± 23	1.581
No. 5	2936 ± 54	999 ± 31	2.938
No. 6	5145 ± 71	1492 ± 38	3.448

These results told us: (1)Zinc is the dominant product of Pd nuclear transmutation; (2)The ratio of area different from No.6 sample (pure zinc) means that every sample shifts its ratio of isotope (^{64}Zn/^{68}Zn)—i.e. products of Pd nuclear transmutation have different ratio of isotope in comparion with that of the natural zinc; (3)The experiment is reliable. Zinc is not a contamination and does not come from the natural environment and (4)there are some other peaks of Gamma Ray, for example ^{187}W, ^{192}Ir etc. These elements are not found in No. 2 sample (original Pd).

[1] D.W. Mo,Y.S.Liu *et al.*, 'Search Precursor and Charged Particles in "Cold Fusion,"' ICCF-2, p. 123-127; D.W. Mo, L. Zhang, *et. al.* "Real-Time Measurement of Energetic Charged Particles and the Loading Ratio(D/Pd)," ICCF-3, p. 535-538.
[2] X.Z. Li *et al.* "Precursors to 'Cold Fusion' Phenomenon and the Detection of Energetic Charged Particles in Deuterium/Solid Systems," *Fusion Technology*, 20, 330 (1991); X.Z. Li *et al.*, Abstract for ICCF-7.

ANOMALOUS HEAVY ATOMIC MASSES PRODUCED BY ELECTROLYSIS

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A recent theory by J.C. Fisher of low-energy nuclear reactions proposes that neutrons bound into clusters (polyneutrons) are the causative agent in the generation of excess thermal power and in the appearance of nuclides that were not present initially in the specimen. A prediction of this theory is that stable neutron-rich atoms should be generated. The present work seeks to test this prediction specifically for neutron-rich carbon and nitrogen. The technique applied limits the detection by high-resolution mass spectrometry of oxides, formed from species on an electrolysis cathode, which are stable at 1020-1050°C and which are volatile at room temperature. Very heavy masses were found from four used cathodes which were not seen from the corresponding blanks. Of these, tbe masses between 231 and 240 AMU appear very much over a random distribution of false signals in the mass range 200 to 400 AMU. Inferring that these significant masses represent CO_2, its carbon is a neutron-rich atom of atomic weights between 199 and 208 AMU. Fisher's theory predicts carbon atomic weights between 187 and 208 AMU. We conclude that the polyneutron theory must be taken seriously and that experimental techniques must be devised to provide positive evidence for the generation of neutron-rich nuclides.

SEARCH FOR NUCLEAR REACTION PRODUCTS IN HEAT-PRODUCING PALLADIUM

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EPRI has sponsored several research projects to check the claims of cold fusion made in the 1989 announcement of Pons and Fleischmann. The evidence obtained indicates that the claimed amounts of excess heat in highly deuterated palladium are indeed present under conditions difficult to achieve but successful in some 30 to 50% of the serious attempts. While the excess heat appears confirmed, the source of the heat is unclear. By inference it must be from some reaction with at least ten times chemical reaction heat outputs per atom present, well above 200 electron volts per atom. The only known reactions in this category are ones involving the nucleus. The few observations of normal products of nuclear reactions such as neutrons, tritium, radioactive isotopes and gamma rays have been rare and always at intensities from 6 to 12 orders of magnitude below the levels needed to explain the observed watt-level excess powers. However, these observations are at least 40 orders of magnitude above expectations from current nuclear reaction theory. Recent efforts to find the source of the excess heat have focused upon measuring changes of ratios of stable isotopes in palladium cathodes that have produced the larger amounts of total integrated excess heat over their time in the electrochemical cells. Such changes might be expected if the roughly commensurate helium-4 observations are assumed to be one of the products of the nuclear heat-producing reaction. Results from several such cathodes from various sources will be shown. The analytical method used for this measurement of isotopic ratios is prompt gamma neutron activation analysis (PGAA) in the thermal neutron beam exiting from a research reactor. Results from PGAA on some 20 different cathodes or virgin materials from a number of different laboratories will be presented. In a number of cases it appears the boron-10 impurity may be depleted relative to the amount present in the virgin material from which the cathode was produced. This result must be confirmed by many more analyses on the same and other cathode materials, to assure ourselves that normal impurity content variation within a given batch of palladium is not the source of these observed boron-10 depletions. A number of measurements on cylindrical cathodes above 2 mm diameter with long (several thousand hours) run times in an electrochemical cell without producing measurable

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excess heat has shown that boron depletion is not chemically induced by electrolyte leaching action.

HIGH-TEMPERATURE NUCLEAR REACTIONS IN CONDENSED MEDIA

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Early by us is shown that one of the most significant, on quantity, products of nuclear reactions in condensed media (NRCM), arising at low energy interaction of charge particles for hydrogen isotope in irradiation conditions by accelerated ions at high temperatures target, is tritium [1-3]. Tritium plays the role of indicator, describing availability of NRCM. If it is present, the sufficient quantity tritium for sure registration during experiment means it is possible to be assumed the availability of nuclear reactions, and if is not present of sure tritium registration means and is not present mentioned reactions. The registration only of high-energy neutrons, gamma-ray and charge particles for identification of given reactions is unsufficient, as far as it can characterize the known high-energy processes, casual image, arising during experiment.

The present work is devoted to discussion of theoretical models, enabling to explain the above-mentioned features, given the direction of further researches and to predict the probable results of perspective searches.

We have developed the projects of power-generating devices, productions of new materials and salvaging of radioactive wastes.

1. V.A.Romodanov, V.I.Savin *et al. Proceedings of ICCF-6.* Published by NEDO, IAE, Tokyo, Japan, 1996, v. 1, p.340-344.
2. V.A.Romodanov,V.I.Savin *et al.* Cold Nuclear Fusion. M.:SRC PTP"ERZION," 1997, p.63-69. (In Russian).
3. V.A.Romodanov, V.I.Savin, *et al.* Proceedings. ICENES'96 IPPE, Obninsk, Kaluga Region, Russia, 1997, v. 2, P.504-511.

TRITIUM GENERATION IN METAL BY THERMAL ACTIVATION

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We have shown, that at high temperatures of target, in bombardment conditions by accelerated ions of hydrogen isotope from plasma of powerful glow discharge, the nuclear reactions in condensed media (NRCM) with tritium generation [1-2] can arise. Thus it was established that the energy of bombardment ions in areas of low significances renders the weak influence on the rate of tritium generation[1]. Work [3] for the first time investigates the opportunity of powerful tritium generation by means of thermal activation at interaction of hydrogen isotope with metals. The rate of tritium generation, at thermal activation, depended on the temperature of metal matrix and isotope structure of hydrogen in gas environment.

The present work is devoted to study of influence for experimental method on ratio of the tritium generation rate stipulated by nuclear reactions and unnuclear reasons at thermal activation.

It is shown that, at use of powerful cooling for elements of working chamber, careful outgasing of samples and advanced method of experiment, the contents of tritium in testing probe, stipulated not by nuclear reasons, can reach less 10^{-2}-10^{-3} from the record quantity. Summary of the tritium generation rate reached 10^{10}-10^{11} atom/s.

1. V.A. Romodanov, V.I.Savin, Ya. Skuratnik and Yu. Timofeev. Frontiers of Cold Fusion. UAP Inc., Tokyo, Japan,1993, p. 307-319.
2. V. Romodanov, V. Savin, Ya. Skuratnik, V. Elksnin. Proceedings: ICCF4. TR-104188-V3, EPRI, 1994,p.15 (1-15).
3. V.A. Romodanov, V.I. Savin *et al.* Cold Nuclear Fusion. M.: SRC PTP"ERZION," 1997, p. 63-69. (In Russian).

NUCLEAR REACTIONS IN CONDENSED MEDIA AND X-RAY

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By us it is shown that at excitation of nuclear reactions in condensed media with low energy of interaction for charge particles (NRCM), one of the main products is tritium [1-3]. The measured ratio of various products for reactions of excitation by ions bombardment from plasma of powerful glow discharge has made for neutrons/tritium, about 10^{-9}-10^{-7}; for charge particles/tritium, about 10^{-7}-10^{-6}; for gamma ray/tritium, about 10^{-6}-10^{-4} [2,3]. It is thus possible to conclude, that at occurrence of NRCM on hydrogen isotope, basically only one tritium is generated and registered. Such characteristic features of NRCM make, at present, problem of study for possible of low energy charge particles generation and X-ray one of the most important ones. We hope that X-ray will unequivocally accompany the tritium generation. On all visibility, this unique radiation, which can be safety fixed in process of NRCM, was opened by us.

The present work is devoted to the study of generation X-ray at occurrence of NRCM. The first results on darking of X-ray films are received and it is current the preparation to registration of the radiation by various gauges. The results on conformity for generation of electromagnetic radiation and tritium are discussed.

1. I.I. Borisov, V.A. Vasil'ev, V.A. Romodanov et al. Letters in *JTP*, 1995, v.21, n.6, p.64-68. (In Russian).
2. V.A. Romodanov, V. Savin, Ya. Skuratnik. *Proceeding of ICCF-6*, Japan. NEDO,IAE. Tokyo, Japan, 1996, v.2, p.590 -594.
3. V.A.Romodanov, V.I.Savin, at al. Proceedings. *ICENES'96*, IPPE, Obninsk, Kaluga Reg., Russia, 1997, v.2, p.504-511.

OBSERVATION OF (DD)-FUSION REACTION PRODUCTS IN ELECTROLYTICALLY DEUTERIZED PDO/ PD-STRUCTURES

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Emission of protons and neutrons was observed in PdO/Pd deuterized structures. The samples were prepared by vacuum annealing of Pd foils with thickness of 30 and 40 microns. Then the samples were annealed in oxygen. The thickness of the PdO layer was 200Å.

The samples were used as cathodes in electrolysis of 1 M NaOD solution in D_2 0. Then, they were placed near the detectors to observe nuclear emissions (neutrons and charged particles), as a result of fusion reactions: d + d - > n + He^3 (1) or d+d -> p+T (2).

The neutron emission was measured by two types of detectors: (1) plastic scintillation detector with Cd and (2) He-3 counter based detector. Charged particle emission was measured by CR-39 plastic track detector.

It was observed that the neutron and the proton emissions may be uniform during the long-time with an intensity 1 1/s into 4 Pi Sr. "The burst" regime was also possible with emission of 103 partcles during the time less than 100 s.

The ratio of proton and neutron fluxes was estimated as Np/Nn ≅ 1.

In CR-39, it was also observed that proton and triton double tracks resulted from the reaction (2). Microphotographs of a proton "burst" and those with double pT-tracks will be presented for publication.

The results of experiments with various detectors are in good agreement with each other. This allows us to make a conclusion that (dd)-fusion reactions really take place in deuterized PdO/Pd structures.

AN EXPLANATION FOR POSITIVE AND NEGATIVE RESULTS CONCERNING ANOMALOUS EFFECTS IN SUPERIONIC CRYSTALS

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Considerable recent attention has been focused on the experiments with oxide bronzes and other superionic materials.

We elaborated a criterion which permits us to predict neutron generation from oxide bronzes. At first it was associated with the existence of the perfect structure channels, in which a fast ionic transport occurs [1]. We then reduce it to include "working" perfect channels where the mechanism of feedback has to be considered. One such physical manifestation is our hypothesis that neutron generation occurs at the moment of disruption of the channel structure as a result of external effects. Fusion reaction rate in the Na_xWO_3 depends on the value P = n N (l- y)(l- x), (1) where N is number of channels, which are perpendicular to working crystal face (and which depends on the area of this face); x is portion of sodium in the lattice; y is fraction of imperfect channels; n= h/a, h is depth of deuterium penetration in surface layer in which a bronze becomes semiconductor system as x decreases, a is parameter of crystal lattice. If the sample is small enough, we may believe that external effect breaks n-layer along all crystal at one time (we may suppose that there is one disruption in each channel). If we take h=3 10^{-6} m, a=3.86^{-10} m, we shall obtain the rate R~ 10^{-18} events s^{-1} per deuteron pair that corresponds the value of ref. [2]. Taking into consideration that neutron generation occurs at the moment of channel disruption, then in principle other number of layers (n=2) appears in eq. (1). Also taking into account that number of "working" channels may differ sufficiently from N, we have more real value of R~ 10^{-22} - 10^{-21}, d^{-1} s^{-1}.

Then a necessary condition for a positive result is in sufficient number of perfect channels. Neglecting to do this in bad experiment will cause y=1 and negative result. In order for succesful prediction of results to be made, we need to tentatively know the magnitude of y, which is determined by surface conditions, impurities etc. An unsuccessful experi-

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ment may also be motivated by the fact that a perfection is disrupted even during the saturation with deuterium. Finally, little or no result may be observed if the number of "working" channels associated with external effect is small. We emphasize that the channel structure of bronzes acts as "working" deuteron accumulator. Man-made capillary systems may play a similar role. Our model is adaptable also to anomalous effects in ceramics [3]. In Mizuno's hypothesis [4], the neutron generation occurs in d-Pt reaction. Such situations fall in to the pattern n=2 in our model, when the disruption of channel lies in its exposure along the interphase boundary containing Pt (or Pd, W, Mo, etc). Deuterium may also interact with other metals positioned in the neighborhood of breaking of bonds inside the channel.

[1] Vakarin S.V. *et al. Proc. ICCF-5*, p. 227; ICCF-6, v.2, p. 606.
[2] Kaliev K.A. *et al. Phys. Lett. A.*, 1993, v. 172, p. 199.
[3] Samgin A.L. *et al. Proc. ICCF-3*, v.3, p. 5-1; ICCF-6,v. 2, p. 564.
[4] Mizuno T. *et al. Infinite Energy*, 1995, Sept.-Oct., p.9.

QUANTUM-BIOLOGICAL APPROACH TO THE STUDY OF ANOMALOUS EFFECTS IN DEUTERIUM-SOLID SYSTEM

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As has already been noted by Fleischmann in the context of the cold fusion problem, a progress in the ideas of condensed matter physics may lead us to a totally different understanding of biological processes, and that is going to be more significant than cold fusion [1]. We pointed out [2] that there are some grounds for believing, in turn, that a selection of anomalous biological and geological effects, biological and nuclear transmutations, and other phenomena examined in cold fusion may provide examples of the versatility of the same unknown physical mechanism.

In the present paper some puzzling parallels between anomalous phenomena in the solid-hydrogen isotope systems and quantumbiological processes associated with the energy transfer are considered. It is shown that a better understanding of many of the cold fusion peculiarities is gained in terms of quantum biology. Proton transfer in the specific bonded chains, formation of the double well potential, peculiar mechanism of the propagation of elementary excitations are typical both for solid state protonic conductors and for such events as gene mutations or processes in DNA. Reactions in protonic conductors as well as main chemical reactions in the cells occur along the distinctive quasi-unidimensional chains. The availability of nonequilibrium conditions is of fundamental importance in cold fusion. However, the requirement on nonequilibrium conditions also is an common feature of biology, and only given the processes of feedback, a number of important physicochemical processes in the cell can be realized [3] that must be crucial in cold fusion.

It is possible that cold fusion is a presently-needed step linking the understanding of "anomalous" processes in living and inorganic matters, associated somehow or other with the transfer of particles, energy and information.

[1] Fleischmann M., Interview by *Inf. Energy Magazine*, 1996/1997, v. 2, N. 11, p. 10.
[2] Samgin A.L., Vakarin S.V., *Inf. Energy*, 1997, v. 2, N. 12, p. 64.
[3] Babloyantz A., *Molecules, Dynamics and Life*, Moscow, Mir, 1990.

TRANSMUTATION EFFECTS ON GLOW DISCHARGE CATHODE: NUCLEAR PHENOMENA OR ION IRRADIATION RESULTS ?

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Cathode materials elemental and isotopic structure before and after experiments in low energy ions Glow Discharge were compared. The cathode materials were analyzed after experiment and after post-experimental annealing.

The isotope shift tendency of the Pd, Pd alloys (PdPtW, PdRu; PdNi; PdCu) and in other cathode materials (V, Ag) was observed for matrix and impurity elements.

It was shown that the change of impurity elemental and isotopic composition after irradiation of the cathode by glow discharge plasma ions depends upon the structure of the cathode material and the working environment, ion flux density and the location of the analyzed layer relative to the surface. SNMS, EDS and SMS were used.

The dependence of the isotope ratio of impurity and matrix elements and its concentration upon the type of irradiating ions (protium and deuterium) has been noted. But the groups of a certain impurities were repeatedly observed after irradiation under similar conditions: light-masses 6, 7 10, 11 19, 20, 22; middle masses 0,5 matrix; near matrix (Ag, Yn, Cd, and others) and heavy masses 120-140 (Sn, Te, Ba) by SNMS method. The same results of the elemental composion Pd cathode change were recieved earlier by EDS method. The data obtained in previous experiments were published in the ICCF6 Proceeding [1].

Such elements increasing as Cd, Sn was observed for any Pd based materials usually after Glow Discharge experiments with their different concentration. We found 138, 132 and 167-175 isotope series (Er, Tm, Yb ...). These masses with equal amplitude peaks were noticed in two analyzing layers - the first layer near the surface and the second layer, that was got after 1 micron sputtering. It means that it is not ion bombardment or diffusion process consequence.

We discovered only Cd isotopes group formed (a few backgrounds) in Ag cathode. These masses were repeated in the second scanning layer too.

The quantity of additional impurity elements after ion irradiation decreased in the following order: Pd, alloys PdPTW, PdNi. Additional impurity elements minimum quantity in pure metals was observed for Ag cathode. The maximum increase of impurities correlated with the maximum excess heat during ion irradiation of palladium cathodes in the glow discharge.

1. Savvatimova, I.B, Senchukov A.D., Chernov I.P. "Transmutation Phenomena in the Palladium Cathode after Ion Irradiation at the Glow Discharge." *Proceeding ICCF-6*. Oct. 13-18,1996, Japan, 1996, P. 575-579.

COMPARATIVE π-NOTCH [OPTIMAL OPERATING POINT] CHARACTERISTICS OF SOLID STATE NUCLEAR SYSTEMS

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Several years of investigations of nickel light water systems using noise-analyzing thermal power spectroscopy (1) has revealed a reproducible excess enthalpy achievable through driving these systems only at their optimal operating point or region [π-notch]. These optimal operating points (relative peak output along the input power drive axis) appear to be characteristic behavior of each active nickel electrode.

This analysis is now extended with data from others' reports of excess heat and nuclear ash production in palladium-heavy water systems. There appear to be similar optimal operating points for palladium-heavy water production rates of excess heat, tritium and helium-4.

It is important that attention of investigators in this field consider the fact that isotopic fuel loaded systems may exhibit such an optimal input power drive for maximal product production at intermediate input power levels. The impact of the existence of such optimal operating points is important because, in addition to the problems of achieving adequate loading of active electrode materials, off-peak system operation may contribute to the difficulty in observing the phenomena via failure to achieve significant reaction rates.

1. M. Swartz. "Consistency of the Biphasic Nature of Excess Enthalpy in Solid State Anomalous Phenomena with the Quasi-1-Dimensional Model of Isotope Loading into a Material," *Fusion Technology*. 31 63-74 (1997).

RESULTS OF EXPERIMENTAL STUDIES ON EXCESS HEAT VS. NUCLEAR PRODUCTS CORRELATION AND CONCEIVABLE REACTION MODEL

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To study possible correlation of excess heat phenomenon and nuclear products in "cold fusion" experiments, we have done three kinds of experiments [1-3], (*i.e.*, open and closed elecrolyses of D_2O/Pd cells and D-ion implantation into Ti and Pd metals). This paper summarizes results of 5 years (1993-1997) of studies at our laboratory under the NHE Basic Research Project and proposes a conceivable reaction model of three body deuteron fusion.

Results of open and closed cell electrolyses experiments have concluded that, in relation to excess heat phenomenon, there are no neutrons, no characteristic X-rays (no major high energy charged particles) and, however, marginal level of possible He-4 generation. Results of D-beam implantation experiments have concluded that there are sometimes emissions of high energy alpha-particles and protons which could suggest the anomalously enhanced three body D-D-D fusion reactions in solid. Possibility of linkage between electrolysis and beam-implantation experiments is discussed.

Conceivable reaction channels which can be consistent with the results of three experiments are proposed as: minor channels of 3D to n+p+He-4+21.6MeV,.d+He-4+23.8MeV and t+He-3+9.5MeV and a major channel of 3D to Li-6(g.s.)+Lattice-Energy(25.3MeV). The successive reaction of 4D to 2He-4 +Lattice-Energy (47.6MeV), which is resultantly equivalent to D+D to He-4 +23.8MeV, is also conceived as a major channel of He-4 production.

1) Fukuoka, H. *et al.* "Measurements of Excess Heat and Nuclear Products in Pd-D_2O System Using Twin-type Electrolysis Cells," *Proc. ICCF-6*, pp. 425-432 (1997).
2) Yasuda, K. *et al.* "Study of Excess Heat and Nuclear Products with Closed D_20 Electrolysis System," *Proc. ICCF-6*, pp. 36-44 (1997).
3) Ochiai, K., *et al.*: This Conference.

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Recent Observations that Yield Information on Catalytic Particles

by Joseph L. McKibben, Ph.D. (Los Alamos Natational Laboratory, ret.)

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Introduction

Getting nuclei to fuse together, without catalytic particles present, takes a quite high temperature and is very difficult to achieve on earth. A lot of money has gone into building and testing hot fusion reactors without achieving results that are significant. However, nature seems to be kind in providing us with catalytic particles that are capable of bringing some of our nuclei together in spite of their strong Coulomb repulsion. The author was lucky in that he came upon favorable fractional-charge data in 1981 that the people[1] who took it in 1967 did not analyze properly. No one would pay any attention to my analysis of it until Pons and Fleischmann did their experiment. This eventually allowed me to publish articles in brief form in *Infinite Energy*. There are four articles based on this data in *IE*: in issue numbers 4, 11, 13/14 supplemented with 3 pictures in color on the cover page, and in issue 17. In the next two paragraphs I shall give a synopsis of the particles and the following four sections briefly discuss recently reported observations that seem to supply significant information on the behavior of these catalytic particles.

There is a set of three basic particles, each of which I am calling subquark. They have mass ≈ 1.15 amu each, electric charge +e/6 each, and red, green and blue color "charges"—one may think of these colors as designating three space-time phases that are maintained. Also there are another set of three basic particles, which I am calling positive hemitrons, that have mass ≈ 0.13 amu, electric charge +e/2 and probably antired, antigreen and antiblue "charges." If the above statements are true, it is very logical that a third set of three particles exist, each having electric charge -e/2 and slightly higher mass—these I am calling negative hemitrons. An "atom" can be formed out of three subquarks and three of the six available hemitrons and electrons as needed. Its nucleus presumably may have charges of +2e, +e, 0e & -e; however, the data that I studied did not show the existence of these other charges but does infer it. It did show that subquarks were attached to almost any one of the low mass nuclei and the binding energy in each case was ≈ 15 MeV per nucleon. Three of these subquark-nuclei combinations may join together provided the nuclei attached to subquarks are identical in both Z and A. They are then joined by three + hemitrons and of course electrons to neutralize their charge. These form what I am calling pseudo-atoms since their chemistry resembles that of normal atoms having the same charge; however, their abundance are very tiny. Subquarks with their attached atomic nuclei can catalyze nuclear reactions but only after escaping their confinement in their pseudo-atom.

If the pseudo-nuclei have the same number of neutrons as protons they seem to be stable; however, if they have one more neutron than protons, they are unstable but with a long half life. A prominent example is ^{9}Be which is at the core of the pseudo-silicon nucleus. Two subquarks with their ^{9}Be attached can come together and form ^{16}O with two subquarks in one bundle—two neutrons escape. If it picks up two positive hemitrons we have a pseudo-fluorine ion, but with a charge of -2e/3 since the extra electron is bound by ≈ 8 eV, it can never appear with a positive charge. That ion plus a third of a pseudo-silicon nucleus is the third figure shown on the cover of issue #13/14. I have much more material based on my interpretation of experiments reported in the literature on these type of ions that I have not attempted to publish. Felix Ehrenhaft[2] did measure a charge of -2e/3 due to such an ion being on a tiny droplet of red selenium with radius of only 149 nm on February 2, 1938. Hitler sent his army into Austria on March 12 but being a Jew, Ehrenhaft came to U.S. via London. Here he worked on his magnetic monopole experiment but the American physicists did not take his numerous APS 10-minute reports on his work at all seriously. He was judged to be crazy, perhaps schizophrenic. Now a competent Russian physicist named V.F. Mikhailov took over on this experiment—he published his first paper in 1983 and the final paper entitled *Experimental Detection of Dirac's Magnetic Charge* [3] in 1996. His monopole was a very tiny piece of iron but it behaved as a monopole only while being illuminated by an intense beam of light. Too bad someone did not repeat Ehrenhaft's fractional-charge experiment years ago. If they had, our understanding of physics would be quite different, I believe.

Lithium Activated Oil-fired Boiler, Diesel or Gasoline Engine Performance

The readers of *Infinite Energy* #18 were undoubtedly surprised to learn that putting a small quantity of lithium into oil-fired boilers increased their power output from 10% to as high as 35%. Mallove noted in his article in *IE* that the lithium effect was first observed nearly two decades before Pons and Fleischmann made their announcement in March 1989. Dr. Szilard Berenyi began using lithium stearate as lubricant inside the fire-box of an oil-fired steam boiler years ago and noticed the extra heat output. He received a patent on it on May 26, 1987 and in it discussed at some length his testing it on diesel and gasoline engines as well as oil-fired boilers. I find it difficult to understand why it was not used more than in tests. Unfortunately Berenyi died in 1994. Harry R. Taplin, who is quite expert in boiler testing and very busy at it, wrote an excellent review paper that the readers of *IE* should study. To my mind this nuclear reaction ought to be able to work outside of an oil-fired boiler or internal combustion engine in a properly designed apparatus and Taplin seemed to believe that too—I suspect that is why he called Mallove's attention to this work. He told me at the ICCF-7 conference it was time that people quit burning up our valuable carbon fuel resource and he hoped we could switch to nuclear fuel. As a boiler inspector, he is well aware that our fuel supply is being rapidly consumed.

To Taplin the important need for the fire was to increase the temperature to disperse the lithium so it can more easily react with protons. To me their result demonstrated that the fire-box temperature was sufficiently high enough to activate the catalytic atom of oxygen by removing a hemitron and so was very exciting. It also demonstrated that the presence of the pseudo-oxygen ion would catalyze the reaction of

$$^{7}\mathrm{Li} + \mathrm{p} \Rightarrow {}^{4}\mathrm{He} + {}^{4}\mathrm{He} + 17.346\ \mathrm{MeV}$$

However, if sodium were introduced the following reaction would likely take place.

$$^{23}\mathrm{Na} + \mathrm{p} \Rightarrow {}^{24}\mathrm{Mg} + 12.803\ \mathrm{MeV}$$

Or if potassium were introduced the following reaction ought to occur.

$$^{39}\mathrm{K} + \mathrm{p} \Rightarrow {}^{40}\mathrm{Ca} + 8.329\ \mathrm{MeV}$$

Now there are a few pseudo-sodium atoms due to ^{6}Li being

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attached to subquarks. I have been wondering for some time if light could remove a hemitron. An article in a recent *Science News*[4] noted that the comet Hale-Bopp, observed while going away from the sun, displayed a long tail composed of sodium atoms. It was some 50 million kilometers in length and 60,000 km in width. To me that seems to be proof that the pseudo-sodium atoms got activated by light while quite close to the sun. This seemed to turn the cold fusion reaction on and so the sodium atoms were seen to be widely spread out while on its journey away from the sun. Perhaps our ocean collected some of that sodium along with its pseudo-sodium ions and that caused it to go into the very strong El Nino that we have been experiencing the past year.

To my mind, we are presented here with an excellent opportunity to build heat sources, automobile and truck engines, power plants and airplane jet engines that will operate solely on nuclear energy. The possibility exists that even rockets can take us to Mars and back in fast time—certainly fast considering the way we have to go there with existing technology. A powerful heat source may be developed in a large garage but as one goes up the line trying to build more complicated engines, then more complicated facilities will be required. The space rocket will require a sizable organization to make it work. Pseudo-particles need to be concentrated in the water by a sizable factor. This can be done by somehow giving them an +e/2 charge and removing them by applying an electric field. Then their interaction or force characteristics should be studied by scattering. The three-stage electrostatic accelerator that I had responsibility for building at the old Los Alamos Scientific Laboratory still exists, so it can be restored. Unfortunately, this facility has been retired from service for nearly three years and needs a new 150 ton crane. Other accelerator facilities may work out better but being associated with a competent laboratory makes this one desirable. There are certainly plenty of computers at Los Alamos to design various kinds of rockets using this data and to evaluate their propulsion capabilities. However, before this project can be put into operation, a lot of first-class physicists and administrators are going to have to eat crow—that is, acknowledge that catalytic particles really exist and become excited about them when they realize what these particles can do.

Comments Inspired by Discussion of their Cavitation Device by Perkins and Pope

In the latest issue of *Infinite Energy* there is a very good discussion of the rotary cavitation device of Perkins and Pope which has been under development since 1980. Much earlier versions been built by other people will not be discussed here. Unfortunately, these devices seem to have tricky problems to solve in order to produce consistent yields. One detail that is very important to get right is the water. On page 13 of the latest issue (*IE* # 19) it is stated that "Perkins and Pope found that the source of the water is important. Water from different sources has widely varying efficacy. The best water is from a well over 100 meters deep, extending below granite formations. Distilled water produces excess energy but not as much. Atlanta water does not produce any excess." To me these statements definitely mean that considerable insight could be gotten by analyzing these waters. To my mind the most important analysis would not be for the chemical contamination but for the presence of exotic particles such as +e/2 hemitron ions and pseudo-oxygen ions with charge -e/2 and there may be other types these ions present in the water. Any investigator needs to know about the status of the component particles by some means, as well as the chemical contamination, when developing a fusion device that he hopes will deliver abundant power. I suspect a couple of furnaces, a good mass spectrograph and recorder are the more expensive items needed. The experimentalist should be able to search for both positive and negative ions so as to be able to identify fractionally charged ions. Then the group needs to go on into concentrating the pseudo-oxygen ions of charge -e/2 or perhaps even better the pseudo-hydrogen ions.

It appears to me that the collapse of the cavities of water bubbles is able to release many subquarks with attached ^{4}He nuclei. This combination appears capable of gathering four ^{16}O nuclei together and forming $^{Z=32,\ A=64}$Ge with release of 35.43 MeV. The subquark appears able to transfer two protons into neutrons at the same time so what is actually formed is $^{Z=30,\ A=64}$Zn with a release of 47.05 MeV/c^{2} of mass into kinetic energy. This released energy causes the subquark and the zinc atom to be flung apart and they release this energy to the water as they slow down. They may also knock out more subquarks from pseudo-oxygen atoms while slowing down and so replace those being recaptured.

I wonder if an expert on chaos theory might be helpful—people doing quantum mechanics have studied it. There, an electron passing through matter usually encounters a regular sequence of atoms. One tends to think the interaction at each atom would be identical but it has been shown in quantum mechanics that it is not the same at all because the solution is very sensitive to phase or initial conditions. We have a similar problem in the cavitation devices because it has a sequence of holes. Maybe the rotation speed has a sharp optimum value—that would be easy to test. They seem to be sensitive to being moved to a new location on the earth—could they be sensitive to latitude? Maybe their axis of rotation needs to be aligned in some particular manner with the axis of the earth's rotation. Maybe more of these kind of effects need to be tested.

Dr. Les Case's Catalytic Fusion Device

This man, working alone in Mallove's own state of New Hampshire without his knowledge, has invented and filed an international patent application on a device that appears to be able to produce heat for long periods of time. He announced it at the ICCF-7 conference and he has a wonderful write-up in *IE* issue 19. So I will not repeat the description but go directly to the single point that was not explained—to my mind it is the most important point. What catalytic agent overcomes the nuclear repulsion between the two deuterons and let them come together? Now you can ask the same question about the Pons and Fleischmann reactor. In my mind it is the subquark with a ^{4}He nucleus bound to it that pulled them off the palladium nuclei and got them close enough together to interact.

Dr. Case is an expert on catalytic agents and he indeed selected a good one and one that can even be purchased from a chemical supply house. But it is a molecular catalyst—its nuclear catalytic properties are not at all obvious. However, it is the author's opinion that there is a nuclear catalyst hiding within it. On page 34 it is stated that "The catalyst is made from carbonized coconut shells and Pd..." So it had hydrogen in it and it had been heated to high temperature and likely high enough to release + hemitrons. The hemitrons would pass on out in the gas and the negative pseudo-hydrogen ions would remain behind likely attached to carbon atoms.

I do not doubt that the structure that I showed on the cover (*IE* 13/14) exists but all examples that had been observed in the data had a net charge of the sum of its fractional components of +2e. All the -e/2 ions observed in the data had identical nuclei attached to their subquarks. Still it seems reasonable that pseu-

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do-hydrogen ions exist. In the next section I will be suggesting that this same particle exists in great abundance in space as a neutral or dark particle. So I am suggesting it is the nuclear catalyst that is active in Dr. Case's heat source. It has an advantage over the pseudo-oxygen catalyst in that its subquarks do not transform the palladium nuclei because they have no nuclei attached to them to contribute to that transformation. That may be why its performance was maintained in long runs.

Dr. Randell Mills of Blacklight Power, Inc. claims to have a potent source of power but claims to have obtained it from a quite different nuclear process, see *IE* issue 17, page 21 for a question and answer discussion of it. He claims to get the energy out of hydrogen atoms and to do this he has to treat his hydrogen at high temperature to dissociate the molecules into forming atoms. Now that temperature would also remove hemitrons from pseudo-hydrogen atoms. Now Mills wanted something to absorb exactly 27.2 eV emitted from the hydrogen atom and he noted that was the energy needed to transfer an electron from one K^+ ion to another K^+ ion so he placed potassium into the discharge and his heat production worked well—so he claimed. But if the pseudo-hydrogen ions catalyzed protons into joining the potassium nuclei, ^{40}Ca would have been formed with the release of 8.3 MeV and so it may well have been the source of energy he observed. If he had introduced lithium or sodium the heat output may have been greater but his clever theory would have been voided. More I cannot say since I can not very well visualize the physical experiment he is actually carrying.

Cold Dark Matter

The observations discussed in the previous section suggest that pseudo-hydrogen exists although it was not observed in the data taken by Schiffer *et al.* in 1967. This existence suggests that in space the same general particle may have an electrical charge of zero. Since $\approx$ 0.9, or even greater mass fraction, is believed to be unobserved dark matter, I am suggesting that it is not only dark matter but the origin of all nucleons in the universe. Now a lot of the dark matter may be neutrinos[5]; however, I am not concerned about them for they cannot create nucleons.

A couple of years ago, a fascinating article appeared in *Discover*[6] on recent observations that astronomers were making on formation of stars with the newer telescopes and Hubble in particular. "What they are finding is far more complicated, and picturesque, than they had expected. Not only does gas fall inward, but vast quantities of gas and dust also stream outward, away from the nascent star. Narrow jets of gas race from the stellar cradle at extremely high speeds and stretch several light years out into space." Then the question appeared, "Why do newly forming stars simultaneously take matter in and spew it out?" The author suggests that the particles he discovered were created well before the Big Bang and were brought together by gravity where they formed quasars. In the quasars they were transformed into nucleons but that left 2.8 amu of mass per nucleons to be transformed into kinetic energy. That energy created jets of gas that raced away from the quasar at very high speed. Now more recent observations[7,8] have shown that galaxies are speeding up as they move away from where it is suspected they were formed. This description fits the way the dark-matter particles I have been discussing ought to behave as I visualize it.

Maybe now some organization will take on the responsibility of studying the existence of these particles and also to study their scattering properties. I have already mentioned that the Los Alamos National Laboratory would be a good place for this work to take place even though the electrostatic accelerator facility is no longer in operation—it still can be put back into operation at a cost very much less than a telescope or very high energy accelerator.

Obviously if the statements I have made in this paper are true, there is an immense amount of physics that remains unknown.

References

1. C.M. Stevens, J.P. Schiffer and W. Chupka, "Search for Fractionally Charged Particles in Lunar Soil," Phys. Rev. D, 14, 716 (1976).
2. Felix Ehrenhaft, *Phil. of Sci.*, 8, 404 (1941)
3. V. F. Mikhailov, *Journal of Phys. D* (Applied Physics) 29 #3, 801-4 (14 Mar. 1996).
4. "A New tail for Comet Hale-Bopp," *Science News*, Vol. 151, No. 18, 272 (May 3, 1997).
5. *Science*, 280, 1397 & 1398 (29 May 1889)
6. Adam Frank, "In the Nursery of the Stars," *Discover*, p. 38, Feb. 1996.
7. "Repulsive Force in the Cosmos?" *Science News*, Vol. 153, No. 12, 185, (Mar. 21, 1998).
8. Bertram Schwartzschild, "Very Distant Supernovae Sug gest That The Cosmic Expansion Is Speeding Up." *Physics Today* 51, 17 (June 1998).

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HYDROGEN GAS FROM VACUUM Part III

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Foreword

"Extraordinary Results Reported by Reputable Scientists Continue to be Ignored by the Scientific Establishment."

I believe that the above headline is as appropriate now as it would have been in the time of Copernicus, when the establishment insisted on the Earth-centered universe.

In both cases, new discoveries required more and more complicated explanations, which were "understood" by fewer and fewer intelligent people, in order to retain incorrect basic assumptions.

As in earlier times, the scientific establishment will continue to ignore experimental results which do not conform with their basic assumptions, until their position becomes obviously absurd.

Suggestions of string theories, ten dimensions, etc. are symptoms of the problem. When the house of cards finally falls, *Infinite Energy* will deserve much of the credit.

I believe that discrediting the ether concept led directly to the current debacle. This paper proposes that the knowable universe is permeated with a concentrated matrix of protons and electrons (the ether?) and attempts to explain many physical phenomena on this basis.

Reprints of speeches which were digests of this paper and two other pertinent papers were included in *Infinite Energy*, No. 17.[1]

Introduction

Part I[2] of this paper attempted to demonstrate that many experimenters have produced hydrogen gas in and from partial vacuum. Several experiments were described in which the author produced considerable quantities of hydrogen from such a vacuum. It was concluded that vacuum might be a matrix of the components of hydrogen: protons and electrons.

Part II[3] included a brief history of the ether concept. It attempted to show that a concentrated matrix of protons and electrons conforms to many of the ether suggestions of some of the great scientists of the past.

This paper (Part III), is highly speculative and should be considered as somewhere between pseudo science and science fiction. It is an attempt to explain various phenomena assuming such a matrix. Some portions of Part III may approach truth, while other portions may be fantasy.

The Ether

The classical radius of the electron is 3×10^{-15} meters. This is about 1/1000th. of the radius of the hydrogen atom. The radius of the proton is believed to be the same order of magnitude as the radius of the electron[4]. Protons and electrons have opposite charges and attract each other. For this reason, one might expect a group of protons and electrons to form a matrix in which each electron is surrounded by protons, each proton is surrounded by electrons and the particles are effectively touching. This is analogous to common salt, in which each positive sodium ion is surrounded by negative chloride ions and each chloride ion is surrounded by sodium ions. This is true whether the salt is in the solid or the liquid state.

In either case, the proposed matrix would permeate the salt and be distorted in the vicinity of the charged ions. Light being carried by the matrix would be affected by the distortions.

Although salt is made up of positive and negative charges and appears to be neutrally charged, it has a dielectric constant. That is, it is able to store electrical energy when placed between the plates of a capacitor. The dielectric constant has to do with the polarizability of the medium between the plates of the capacitor. Polarizability, in turn, is a measure of the tendency of positive charges in the medium to move slightly toward the negative plate and negative charges in the medium to move toward the positive plate of the capacitor. This permits more electrons to be stored on the negative plate and removed from the positive plate at a given voltage.

If vacuum contained no charges, one might expect vacuum to have no dielectric constant and a capacitor containing only vacuum to be unable to store electric charge.

Maxwell's equations, which quite accurately predict reflectivity of electromagnetic radiation at interfaces between media, require that vacuum have a definite dielectric constant and a definite magnetic permeability. It is difficult (if not impossible) to understand how a void can have such properties. The proposed matrix of protons and electrons would be expected to be distorted when between opposite charged plates and, therefore, to have a definite dielectric constant.

Magnetic properties of materials are attributed to unpaired electrons which they contain. The proposed medium contains unpaired electrons and would be expected to have a magnetic permeability. A void would be expected to have no magnetic properties.

The mass of the electron and the mass of the proton are known. If one assumes the protons and electrons of vacuum are effectively touching and their radii are close to the classical radius of the electron, one may calculate the density of vacuum to be about one thirteenth the density of the nucleus of a heavy atom. This seems ridiculous, but let us examine the possibility further: An intelligent crab who had spent his life on the ocean floor would assume that sea water had no weight. He would consider the weight of a stone to be what we consider the weight of the stone less the weight of water it displaced. If there were no swimming creatures and ocean water had zero viscosity, he would have no reason to believe in water. If he was particularly intelligent, he might believe that sound was a "field" phenomenon (whatever that means). He would try to explain various other phenomena on the basis of these misconceptions.

Bose-Einstein Condensation

The January 1982 issue of *Scientific American* contains an excellent article by I. F. Silvera and J. Walraven.[5] It discusses the possibility of atomic hydrogen forming a Bose-Einstein condensed gas at a temperature above absolute zero. In a perfect Bose-Einstein condensed gas all of the atoms are in the ground state (*i.e.* in a state of minimum energy at temperatures well above absolute zero). The article states that the temperature at which the condensed gas would be stable increases with the 2/3 power of the density. At the density proposed for the ether, the condensed gas would be stable to about 10^{24} degrees Kelvin. That is, once formed, the medium would be quite stable.

The article points out that liquid helium (4) at temperatures below 2.18 degrees Kelvin has quite strange properties and may be Bose-Einstein condensed. It is a superfluid. That is, it appears

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to have zero viscosity. Once set in motion in a sealed tube, it continues to flow indefinitely. It flows through densely packed powders as if they were not present.

The spaces between the atoms or molecules of any material are about a thousand times the radii of individual particles of the proposed matrix. Matter, then, is a very open sieve to such a matrix. A Bose-Einstein condensed combination of protons and electrons might be expected to have zero viscosity and present no friction to matter flowing through it. A force would be required to change the velocity of an object in the ether but, if there is no friction, the object would continue at the same velocity until another force was applied.

Missing Mass or Dark Matter

Scientists are searching for missing mass or dark matter required to explain the stability of galaxies. They calculate such a mass must be at least ninety times the mass they can see with their telescopes. Doesn't the proposed medium more than satisfy their requirements?

Star Formation

There is considerable evidence that hydrogen gas is being formed in various parts of the universe. The hydrogen gas may be pulled together by gravity until the agglomeration attains sufficient size, density and temperature to initiate a fusion reaction and turn the agglomeration of hydrogen into a star. Where does all this hydrogen come from? If experimenters can convert the ether into hydrogen in their laboratories, should one be surprised if nature performs the same conversion in deep space?

Mass and Velocity

Physics defines mass as the ratio of the force applied to the acceleration produced and assumes that mass is a constant. At velocities close to the speed of light, mass appears to increase with velocity. That is, as the velocity of an object approaches the speed of light, a greater force is required to give it a given acceleration. It is believed that as the velocity nears the speed of light, the force required nears infinity. Even at such high velocities no deceleration would be expected unless energy could somehow be transferred to the ether.

Dilantic suspensions have similar properties. Generally, they are very concentrated suspensions of certain tiny solid particles in low viscosity liquids. Their viscosities increase with the velocity of solids moving through them. A concentrated aqueous suspension of glass microballoons (1 to 10 microns in diameter) is a good example. When one slowly drops ones finger into the suspension, it appears to have a viscosity similar to that of water. When one pokes the finger at the surface of the suspension, it resists and feels like a solid. I have no doubt that one would break his finger if he poked the surface hard enough. Could the ether have similar properties? It seems to behave as a zero viscosity liquid to matter moving well below the speed of light but its properties approach those of a solid to matter which approaches the speed of light. If this is the case, electromagnetic radiation, which moves through the ether at the speed of light, must be a wave phenomenon. Even when moving at speeds close to that of light, objects would retain their velocity, unless there was a mechanism for them to transfer their energy to the matrix.

If one defined mass based on a standard kilogram weight at rest relative to the ether matrix, mass could not vary with velocity. The force required to accelerate the mass would simply increase as the mass approached the speed of light.

The Magnetic Field

In dealing with electromagnetic phenomena, scientists and engineers employ the concepts of electric and magnetic fields in vacuum. That is, they assume that different parts of a vacuum have different properties when subjected to different electrical and magnetic forces. Can this be true if vacuum is a void? A medium of protons and electrons would be expected to be affected differently in the neighborhood of different electrical and magnetic forces.

When a direct current is passed through a coil of wire encircling an iron bar, the bar becomes a magnet. The current produces a magnetic field in its neighborhood. Could the moving electrons in the wire cause neighboring ether electrons to align, producing a magnetic field? The aligning ether electrons, in turn, might cause some of the unpaired electrons in the iron to align, giving the iron bar magnetic properties.

If a permanent bar magnet is moved into a coil, a direct current is produced in the coil. An electrical current is considered to be movement of electrons in the coil. Possibly the aligned electrons in the magnet cause some of the electrons in the wire to align and, in the process of aligning, each affected electron moves a very short distance. The overall effect is a current in the wire. As long as the magnet remains stationary in the coil, electrons effectively retain their orientation and there is no further current. As the magnet is removed (in the direction from which it entered) the oriented electrons in the wire return to their original orientations (on the average) and there is a temporary current in the opposite direction.

If a direct current is passed through an empty coil in a vacuum, a weak magnetic field is produced in the vacuum. This is easily explained if one assumes that the vacuum contains unpaired electrons, some of which are caused to orient by the oriented electrons in the current carrying coil.

A transformer consists of two separate coils on a common iron core. If an alternating current is passed through one of the coils, a continuing alternating magnetic field is produced in the iron core, causing a continuous alternating current in the other coil.

The hum on an AM radio in the vicinity of high tension wires carrying alternating current may be due to a similar effect. Some of the electrons in the medium may orient along with the current carrying electrons in the wire. These electrons may, in turn, cause some electrons in the antenna to orient and produce an alternating current in the antenna.

Electromagnetic Radiation

The above may bear a certain resemblance to electromagnetic energy being passed from one dipole antenna to another. In the case of the transformer, the transmitting agent is unpaired electrons in the iron. In the case of the dipole antennas, the transmitting agent may be the unpaired electrons of the ether.

Picture a metal rod attached to a signal generator set to produce an alternating current of such a frequency that the wave length (in vacuum) of the electromagnetic radiation produced is twice the length of the rod. At frequencies where electromagnetic radiation is produced, it is believed that current moves along the surface of the rod at the speed of light. This suggests that the effect is a wave phenomenon. Now, picture the rod immersed in the proposed ether. The current may be the result of a line of ether electrons along the surface of the rod orienting (a magnetic field?). As suggested above, such orientation would cause each affected ether electron to move toward one adjacent ether proton and away from another (an electric field?). Each affected electron may transfer its energy to a neighboring ether electron. The overall result may be a line of electromagnetic energy (photon?) moving through the ether in a plane defined by the length of the rod. If the ether can not absorb electromagnetic energy, the effect will travel through space until it encounters something which can absorb it (*i.e.* a similar rod parallel to

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the transmitting antenna).

Some scientists picture photons as spherical. The following test indicates that this is unlikely: A foam polystyrene sheet, one face of which is covered with thin parallel aluminum wires one half centimeter apart, is inserted between polarizing transmitting and receiving horns operating at a wave length of two centimeters. When the sheet is perpendicular to a line connecting the centers of the horns, the amount of radiation which is transmitted depends on the orientation of the wires. If the wires are parallel to the electric field (equivalent to parallel to the rod of a dipole antenna), practically all of the radiation passes through the sheet. If the wires are perpendicular to the electric field, almost no radiation passes through the sheet. Perhaps photons may be considered as lines of electromagnetic energy moving through the ether. Each line contains ether electrons at their maximum orientation and displacement (for that frequency). The number of orienting electrons in the photon and the rate at which they are orienting depend on the event which produced the photon. The more photons of a given frequency in a given volume of ether, the greater the intensity of radiation at that frequency. The more rapid the orientation of the electrons, the higher the frequency of the radiation and the greater the extra energy of each orienting electron.

Planck's Constant

Planck's constant is the ratio of the energy of the radiation to the frequency of the radiation. It may actually be the ratio of the extra energy in a line of affected ether electrons (photon) to the frequency of the radiation and have to do with the inertia of an ether electron toward angular rotation. The following is an attempt to explain Planck's constant on this basis:

The extra energy on an activated matrix electron would be

$$E_e = 1/2\, I_e\, w^2.$$

Where I_e = moment of inertia of the electron to that type of spin and w = the extra rate of rotation of an activated electron.

The energy of a photon would be

$$E_p = N_e\, 1/2\, I_e\, w^2$$

where N_e = the number of activated electrons which make up the photon at any given instant. The extra rate of rotation of an activated electron would be expected to increase linearly with the frequency of radiation or, w = A f where A is a constant and f is the frequency. Then:

$$E_p = N_e\, 1/2\, I_e\, A^2\, f^2$$

$$\text{or } E_p = [1/2\ I_e A^2]\, [N_e f]\, f$$

but we believe that $E_p = h f$ where h = Planck's constant.

$$\text{Then } h = [1/2\ I_e A^2]\, [Ne\ f]$$

This suggests that:

1) I_e is a constant, indicating that the dimension of an electron does not change as its rate of rotation varies.

2) The number of electrons involved in a photon at any given instant must be inversely proportional to the frequency of the radiation or h would not be a constant. This is expected, since the number of matrix electrons adjacent to a 1/2 wave antenna reduces linearly with the wave length and inversely with the frequency of the radiation.

Quantization of Energy Transfer

3) Since N_e is an integer, only specific quantities of energy can be transferred by the matrix. There are no fractional matrix electrons. As the frequency increases, the difference between possible energies increases.

I believe that the above observations agree with scientific observation.

Since an ether electron either is involved in transmitting energy or it is not, the proposed photon could transfer only energies which involve integer numbers of electrons. An event can occur only if the energy involved can be removed or supplied. The fewer electrons in a photon, the greater the energy difference between possible photons. This may explain the observed quantization of energy.

More on the Photon

Let us consider the production of electromagnetic energy from a half-wave antenna in more detail. Each rotating electron might be expected to transfer its rotational energy to a neighboring matrix electron. As pointed out above, this may result in an effect which is 1/2 wave length wide moving parallel to the antenna. When the current in the antenna changes direction, a similar effect would be produced but not necessarily in the same plane. The overall result could be energy passed through the matrix in packets.

Could such a packet of energy be what we call a photon? A half wave is efficient because the direction of the current changes just as the photon leaves the antenna.

The Dual Nature of Light

All of the electrons which are part of the photon at any instant are spinning at the same rate and in the same direction. In alternate photons, electrons are likely spinning in the opposite direction. At a given frequency, all activated electrons would have the same spin energy and all half wave length photons carrying a given frequency would have the same energy. The concentration of photons would decrease with distance from the antenna but the energy of each photon would remain the same.

If a photon near the antenna can produce a given photoelectric effect, a similar photon far from the antenna can cause the same effect. This leads to a simple explanation of the, so called, dual nature of light. That is, although light is a wave phenomenon, it can appear to be a particle phenomenon.

The Heizenberg Uncertainty Principle

The effect can be considered as a line crossing a checkerboard. Picture the lighter squares as ether electrons and the darker squares as ether protons. Energy from the first electron of a photon can just as readily pass its energy to either of two neighboring electrons. In three dimensions, there are still more matrix electrons with an equal chance of receiving the energy. Even if one knew the past history of the effect and which matrix electron had the extra energy at a given instant, one could not know to which neighboring matrix electron the energy would be passed. This may remind some physicists of the Heisenberg Uncertainty Principle.

Annihilation

If one calculates the energy produced when a positron and electron combine to lose all their mass and assumes that all of the energy is given off as a single photon, one obtains a wave length of 12.1×10^{-13} meters. If two photons were given off, photons having a wave length of about 24.2×10^{-13} meters would be produced. Scientists have found radiation of these two wave lengths under conditions where positrons would be expected to be combining with electrons. The proposed ether has a fine enough structure to carry such photons.

The Positron?

The above process is called annihilation because it is assumed that the positron and the electron involved combine to form nothing. Later in this paper, I will picture the electron as a disk or ring spinning about one of its diameters (much as a coin or a wedding ring spins on a table). If it also spins about its center and this spin contributes to its electrical charge, the only difference between a positron (which has the same weight as an elec-

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tron but the opposite charge) and an electron may be the direction of this spin.

If an electron was flipped 180 degrees in the ether field, would it become an positron?

The Neutrino?

Combination of such a positron and electron might be expected to release considerable energy and result in a particle which has very little mass and is neutral in charge. Could the particle thus formed be the neutrino? It may be pertinent that electrons and positrons mysteriously appear in the presence of gamma photons. Could they result from absorption of the proper gamma radiation by a neutrino?

Recently, it has been reported that flashes of gamma radiation appear to be impinging on the Earth. Surprisingly, the concentration of flashes is about the same in the direction of the Milky Way (Earth's galaxy) as toward deeper space. Could the flashes be energy released from the formation of neutrinos from positrons and electrons in space? We would only note the combinations which happened to send off gamma photons in the direction of our detectors.

The Neutron?

The energy from our sun is believed to be the result of the fusion of hydrogen atoms to form helium atoms. The overall effect is the combination of four protons and four electrons to form an atom made up of two protons, two neutrons and two electrons. This suggests that a neutron may, somehow, be produced from a proton and an electron. The helium nucleus is much more dense than the proposed ether, which I have suggested is a matrix of effectively touching protons and electrons. If one pictures protons and electrons as hard spheres, the above statements are difficult to reconcile. If, however, one pictures the ether particles as disks or rings, which are spinning in such a way as to sweep out a spherical volume, the statements are compatible. The higher density of the helium nucleus could result from part or all of this spin being overcome by the mutual attraction of the particles and the energy produced being carried away by the ether as electromagnetic radiation. It is interesting that individual neutrons have half lives of about 12 minutes[6]. They decompose into protons and electrons. The helium nucleus is stable indefinitely. Could it be that the helium nucleus is four proton disks and two electron disks oriented in such a way as to form a stable arrangement? If so, other nuclei may be more complicated arrangements of protons and electrons and all atoms (and, therefore, all materials) may be made up only of the ingredients of the ether.

The proposed medium has considerable mass and would be attracted to other masses. The portion of the medium in the vicinity of the Earth would be expected to move with the Earth and spin with the Earth as do all the other masses near or on the Earth. If this is the case, the results of Michelson and Morley's ether drift experiments (referred to in Part II of this paper) would be expected.

Transmutation

Recent papers [7,8] give strong evidence that nuclear transformations take place under surprisingly mild conditions. Sir J.J. Thompson and others reached a similar conclusion based on experiments performed prior to 1930.[9]

The mass of a free neutron is 1.67482×10^{-27} kg. and the mass of a hydrogen atom is 1.67343×10^{-27} kg.[10] If, as suggested above, each is made up of a proton and electron, proper addition of energy may temporarily convert a hydrogen atom into a neutron. As noted above, a free neutron has a half life of 12 minutes but it is typically absorbed in less than 10^{-3} seconds when passing through materials.[6] Absorbed as what?

Physicists believe that free neutrons have wave properties and that the wave length of a free neutron is much too great for it to fit into a nucleus. I propose that a free neutron is too large to fit in the nucleus but if its proton and electron disks lose the spin that makes them appear spherical, a neutron can become part of the nucleus. Indeed, a nucleus may be the catalyst for the change. The overall result may be the formation of one or more new nuclei and the evolution of considerable energy.

The masses of the hydrogen atom and the neutron are similar but the energy difference is considerable. How could the energy needed to convert a hydrogen atom into a neutron be supplied?

Conversion of the ether at the cathode surface into hydrogen appears to require considerable energy. The reverse reaction would be expected to produce considerable energy in an extremely small volume. Perhaps in the presence of a high concentration of hydrogen atoms, the energy produced may convert a hydrogen atom into a neutron.

Astronomy

I have no clue as to whether the quantity of ether is finite. If it is finite, the knowable universe might be expected to be a sphere surrounded by void. The ether-void interface would be a perfect mirror and there would, likely, be no way of knowing whether observed radiation had been reflected from that interface. Perhaps, some of the radiation believed to be from great distances originated in our own galaxy and has been reflected back to us.

The Red Shift

Spectral lines in light from distant stars are shifted toward lower frequencies (*i.e.*, to lower energy). The greater the distance the light has traveled, the greater the shift in frequency. The shift is usually explained by assuming that the stars are moving away from us and the farther they are from us, the faster they are moving relative to the earth. Most astronomers conclude that the universe is expanding.

If one defines the size of the universe as the volume of the ether, expansion means an increase in the separation between ether particles or an increase in the number of ether particles. Either prospect seems unlikely. An alternate conclusion is that objects in space are, on the average, moving away from each other and filling more and more of the ether.

The shift of light to lower frequencies can be explained, just as readily, if one assumes that light slowly loses energy as it travels through the ether. A partial loss of energy can be equivalent to a decrease in frequency.

If, as suggested above, hydrogen is produced in space, the energy required may be removed from photons traveling through space. The hydrogen and other particles in space may remove energy from photons, producing a red shift. If this is the case, the universe is, likely, not expanding.

Particle Physics

Most of our information on the various particles of physics comes from particle accelerator experiments. Those who analyze the results of these experiments assume that the collisions they study take place in a void. If they actually take place in a matrix of protons and electrons, conclusions which have been drawn may be incorrect. The extremely short-lived particles detected may not have come from the atoms or particles being studied. They may merely be fleeting combinations of ether particles in the vicinity of the collisions.

Gravity

All particles attract one another. Mass is a measure of this attraction. In the case of charged particles, electrical attractive and repulsive forces are much stronger than mass forces. In uncharged matter and in ether, all charge forces are balanced, so

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mass forces predominate. Nuclei are denser than ether and are, therefore, more strongly attracted to other masses than is ether. Similarly, a helium filled balloon is attracted to the earth but air is attracted more strongly.

If materials are nuclei or groups of nuclei imbedded in the ether, they are always more dense than the ether and more strongly attracted to matter than is ether. In a recent paper[11], I have suggested that gravitational attraction may be related to the polarizability of materials at a background frequency (detected by the COBE satellite).

Atomic and Molecular Structure

Picture a charged nucleus surrounded by ether. One would expect the ether in the vicinity of the nucleus to be distorted, just as ether would be distorted in the vicinity of a charged plate. The greater the charge on the nucleus, the greater the distortion. Could the atom be the nucleus and its effect on the nearby ether and the effective radius of the atom a measure of the distance of this effect? Wave equations are supposed to give the statistical chances that an electron associated with the atom will be in a given position relative to the nucleus. Perhaps there is no particular electron associated with the nucleus and the wave equations describe a contour map of the effect of the nucleus on the ether. If the atom absorbs energy from the ether, the contour map would be affected. The number of possible contour maps are limited because the energies which the ether can transmit are limited.

Molecules are combinations of atoms. Could the bonds which hold them together be the effects of the combined atoms on the ether?

Summary

Part I[2] of this paper gave evidence that hydrogen gas has been produced from vacuum. Part II[3] suggested that the knowable universe may be filled with a concentrated matrix of protons and electrons and attempted to compare this matrix to the ether proposed by great scientists prior to the advent of modern physics. Similarities to the ether concepts of Christiaan Huygens and Sir Oliver Lodge are particularly pronounced.

Part III has attempted to explain many observed phenomena by assuming such an ether.

References

1. Hydrogen from vacuum. A Brief History of the Ether. Time, Mass, and Velocity. *Infinite Energy*, Vol. 3, No. 17, 1997-1998, pp. 80-85.
2. P. Rowe, "Hydrogen Gas from Vacuum, Part I," *J. of New Energy*, Vol. 1, No. 2, Summer 1996, pp. 108-111.
3. *ibid*. p. 112-115.
4. Weidner, R.T. and Sells, R.L., *Elementary Modern Physics*, Allyn and Bacon, Inc. Boston, MA, 1968, p. 375.
5. I. Silvera and J. Walraven, "The Stabilization of Atomic Hydrogen" *J. Scientific American*, Jan. 1982, pp. 66-74.
6. *Elementary Modern Physics, loc. cit.* p. 415.
7. J. Bockris & Z. Minevski, "Two Zones of 'Impurities' Observed after Prolonged Electrolysis of Deuterium on Palladium" *Infinite Energy*, Vol. 2, No. 5 & 6, 1996, pp. 67-69.
8. T. Mizuno, T. Ohmori, and M. Enyo, "Anomalous Isotropic Distribution in Palladium Cathode after Electrolysis,"*Infinite Energy*, Vol. 2, No. 7, 1996, pp. 10-13.
9. P. Rowe, "Controlled Transmutation of Elements Under Surprisingly Mild Conditions?" *Infinite Energy*, Vol. 2, No. 8, 1996 pp. 30 - 31.
10. Elementary Modern Physics, loc. cit., inside covers.
11. P. Rowe, "Gravity, Dielectric Constant and the COBE Satellite,, Toth-Maatian Review, Vol. 13, No. 1, 1996, pp. 5905-5909.

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the desired cell current is 0.2 A and the cell voltage is 2.0 V, then the rheostat should be set at 10 Ohms and the source voltage at 4 V. The power electrical input to the cell will then be 0.4 W. If the cell voltage should increase by 5% to 2.1 V, the cell current will decrease to 0.19 A and the power will decrease to 0.399 W. If the cell voltage should decrease by 5%, the cell current will increase to 0.21 A and the power will decrease to 0.399 W. In either case a 5% change in cell voltage results in only a 0.25% decrease in cell power or, in this case, one milliwatt as compared to a 20 mW total change with a constant current power source. This should decrease the problem with temperature time lag in the calorimeter.

Summary

The majority of the experimental results reported by Miles *et al.*[4] are supportive of the fusion processes proposed earlier[3]. The recommendations for improving reproducibility, increasing the reaction rate, and decreasing the onset delay time is to dope the palladium cathode with about 1 ppm rhodium. Early experiments should probably use an even lower doping level, perhaps one part per billion. This would increase the average spacing of rhodium atoms to about one every thousand palladium atoms in all directions. This will reduce the disruption of the Pd lattice and also decrease the probability of thermal runaway.

The use of cerium to enhance the loading of deuterium into the palladium as done by Miles is worth pursuing. The substitution of boron (also suggested by Miles) for rhodium also bears further investigation.

References

1. Storms, E. "Review of the 'Cold Fusion" Effect.' *J. of Scientific Exploration*, Vol. 2, No. 2, 1996.
2. Fleischman, M. and Pons, S. "Electrochemically Induced Nuclear Fusion of Deuterium" *J. Electroanalytical Chemistry and Interfacial Electrochemistry*, Vol. 261 (April 10, 1989): 301-308.
3. Josephs, H.C. "Nuclear Processes in Palladium Deuteride," *Infinite Energy*, Submitted for Publication, September 1997.
4. Miles, M.H., Bush, B.F., Johnson, K.B. "Anomalous Effects in Deuterated Systems," *Infinite Energy*, Vol. 3, No. 15 & 16.
5. *Handbook of Chemistry & Physics*, 70th Ed., CRC Press.

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"The model is inspired by supernova physics, where the large density of weak interaction reactants make weak interactions a dominant player in the evolution of the stellar dynamics. The combination of neutron capture and beta stabilization leads to the production of post iron nuclei in the later stages of explosive star death.

"The key process suggested by the nucleo-weak model is the weak capture of mobile electrons by the hydrogen isotopes of the water in the presence of the pre-transmutation, spectator nuclei. Neutrons (real or virtual) resulting from these captures would be absorbed by the spectator nuclei to obtain neutron-rich end states, which could then stabilize to the observed isotopes."..."The weak sectors of the nucleo-weak chains would yield neutrinos as by-products, and these would escape detection. Energy deposition in the system could occur through many body effects distorting the pure weak decay kinematics. The absence of observed radiation is also compatible.

"The problem of the exact mechanism by which the weak sectors initiating the nucleo-weak chain could be catalyzed during the electrolysis process is not yet adequately explained by the model, and detailed numerical calculations of nucleo-weak processes in the experimental environment would be needed to obtain improved predictions for these."

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The Need for a Plan "B"

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NASA has a web site with the name (and subject matter) of "Breakthrough Propulsion Physics Program." The leading comment is "NASA is embarking on a new, small program called Breakthrough Propulsion Physics to seek the ultimate breakthroughs in space transportation: (1) propelling a vehicle without propellant mass, (2) attaining the maximum transit speeds physically possible, and (3) creating new energy production methods to power such devices. Because such goals are beyond the accumulated scientific knowledge to date, further advances in science are sought, specifically advances that focus on propulsion issues."[1]

NASA should be commended for this action. I like this "goal setting" action so much that I am asking for your help and guidance in expanding this idea. We have other pressing problems that could benefit from concerted efforts of a "breakthrough program." The first two that come to my mind are cheap energy production (fusion?) and room temperature superconducting materials. You can probably think of one or two more.

Perhaps you are thinking that we already have programs working on the two new tasks that I suggested. Yes, you are right, we have been working on "the problem" of fusion for 50 years (and $10 billion), and we have been working on "the problem" of superconductivity for 30 years (and approximately $1 billion).

Abundant energy is what drives our technological economy (the current fusion program has been on the verge of working for 35 years), but we need something that actually works and the dispersion/transporting of electrical energy (provided by super conductors) would speed up the pace of our technological progress.

Most quantum leaps in development have centered around the added control of energy, *ie.* More power is better: *sailing* ships were replaced by *steam* ships, *propeller* airplanes were replaced by *jet* airplanes, and *steam* locomotives were replaced by *diesel* locomotives. On the other hand, several advancements have centered around miniaturization, where more control is better: radios, television, telephones, and computers. Only steam ships, of these past advances, required any new physics and that was 250 years ago.

Asking for a breakthrough implies either of two ideas. The first idea is to "speed up" the development process of a partially understood physical phenomena. Nuclear fission seems to fit this definition of breakthrough. We appear to understand the physics, so we need an acceleration, *i.e.* breakthrough, of the implantation process.

The other form of a breakthrough request appears to assume that we need an entirely new way of looking at the physics, or a new physical phenomena. NASA's request for a new propulsion *method* fits this definition.

So, the new breakthrough sought by NASA and the two that I mentioned probably need new and/or better understanding of our physical world. The NASA web page says it best: Credible Progress Towards Incredible Possibilities.

How do we get these things called "breakthroughs?" With your help, we need to do something different, thus an *alternate plan*, a Plan B.

Why do we need this "Plan B ?" Well, in most technical problem solving exercises, we know that it is hard to solve a *problem* unless we know what the *problem* is.

So, what is the *problem*? For NASA, and the two other areas of inquiry at least, the problem is that our science and technology does not get us where we want to be. We can think of devices that we do not know how to build. This has been the job of "science fiction" writers for a hundred years. And up until about 30 years ago, inventors and industry have provided us with working models after a few years, sometimes with quantum leaps in development.

The people at NASA have put their finger squarely on the problem. "Paradoxically, it is at the point of diminishing returns of an existing technology when it is most difficult to explore alternatives. Institutions that grow up with a technology become too established, too uniquely adept at their technology to consider alternatives that appear outside their area of expertise. Established institutions tend to modify, augment or find new application for their technology rather than to search for ways to go beyond their technology."[2]

An additional problem with institutions "within their area of expertise" is the effect of inertia, once *the* path is chosen, all other paths are automatically excluded. If 50 years of "progress," as in the fusion program, is *not* successful, the current view is to continue on *the path* and ask for more money.

Why can we not just continue on the path we are on? After all, our science and technology have been very successful. Just look at all the wonderful inventions that we have at our disposal!

Our science and technology have given us wonderful inventions, but all of them are improvements on ideas from the 19th century. Llewellen King (1991) said, "This is another problem in science, and that is that we tend to spend all of our efforts to replicate something that we have, instead of taking that 'Quantum Leap Forward' to the next thing! Whatever we have done to improve the production of electricity, we have done one tremendous thing: and that is nuclear. We are still boiling water! And we are still using 19th century plumbing. We are using 21st century technology on top of 19th century plumbing! It is theoretically possible that we could at some point take this 'Quantum Leap.' However, (from where I sit and what I see) the evidence is not promising. There is nothing in sight that looks as though it can substitute for the way we do it now."[3]

Talking about our "War for Energy Independence" set out by President Jimmy Carter in 1977, Dr. J. Stuart Fordyce (1992) stated, "Have we achieved any of these goals? The results are mixed. Some we did . . . but most we did not. Why not, you ask? Well there are several reasons, but the main reason is simply we, the technical community, didn't deliver. We didn't make the technological breakthroughs we promised."[4]

Vernon J. Ehlers' editorial in the January 1998 issue of *Science* said, "Although the United States' science and technology enterprise has achieved enormous success, it is essentially operating on autopilot. These new times require us to reformulate our national policy . . . It is time to wipe the slate clean and decide on a future-based version of where science can, and should, take the nation."[5]

If we agree that we would very much like to have different results than we have now, we must do something different, to "explore alternatives." How do we go about acquiring new

technology? How do we "decide on a future-based version of science?"

NASA says, 'To begin the search for the solutions to make interstellar travel practical and affordable, it is necessary to search beyond current understanding—go back to the sciences from which technology emerges and search for further scientific advances which will lead to propulsion breakthroughs—the kind of breakthroughs that would make interstellar travel practical."[6]

NASA's goal is very specific, *i.e. practical* interstellar travel. I suggest the other breakthroughs that have been mentioned need nearly the same strategy: go back to the emergent science of the 19th century.

For the theoretical science base we need to return to the historical base and work toward the present, "to go back to the sciences from which technology emerges." If things are not going well now, go back to where they were doing well and work forward from that base. The transition from Faraday to Maxwell is where I started looking.[7]

A subset of science theory should address the problem of models that do not require a Ph.D. in mathematics. Ten years ago (1991), Edward Teller noticed, "Then (four decades ago), as now, Dr. Teller believes that illiteracy in sciences is an increasingly great danger to American Society, not only for our children but also for the growing adult population."[8]

As an example, Chris Hillman responded to a newsgroup question in December 1997: "Searching for 'physical models' for how gravity 'works' has pretty much fallen out of favor. The modern attitude is that all you should hope for is a mathematical model ('as simple as possible, but no simpler') which makes predictions which hold true to sufficient accuracy."[9]

For the alternate technology model, I suggest Vannever Bush's model of 1940, as exemplified by the results that came out of the war effort and Bell Labs in the 1950's. Eugene Mallove, Sc.D., reports in *Infinite Energy* Magazine (1998), that "we *would* set up a Tinsley/Schwinger Foundation *immediately* to channel tens of millions of dollars into grants to worthy scientists and engineers who want to work on New Energy Technologies - several hundred such scientists each year for years to come."[10]

So, we have established the general problem. We are not where we want to be. We have action from a consumer-of-science group (NASA) publicly requesting an alternate path, we have laments from the establishment (Teller and Ehler) reporting in the establishment media undesirable conditions in mainstream science, and we have a major player in the non-mainstream-science area (Mallove) offering a service to society if there was a benefactor providing financial support (money).

To point out the serious need to do something different, I will bring this to your attention: there has been NO new inventions, based on current physics, in 90 years. The normal lead time for inventions after a scientific breakthrough is approximately 20 years. That means that we are 60 to 70 years late for reaping the benefits from 20th century physics.

What I am saying is we need a lot less "progress" and a lot more "success."

NASA says that "To address the most visionary end of this scale, the Marshall Space Flight Center sought out the work of this Lewis Research Center team. Marc G. Millis, the leader of the Lewis team, assembled a group of government, university, and industry researchers to propose the Breakthrough Propulsion Physics Program, as a part of this Advanced Space Transportation Program. In July 1996, this Breakthrough Propulsion Physics program was formally established."[11]

For circumventing limitations, NASA says, ". . . the pioneering work style seeks out new approaches for which there is little established knowledge. This requires confronting ignorance and creating new knowledge. It requires imagination to envision future possibilities and the intuition and subjective judgments to navigate in the absence of an established knowledge base. Because of the fledgling nature of pioneering work, there is seldom enough definition to allow accurate measures of potential benefits and risks. Agencies of large companies that are responsible for judiciously apportioning their personnel, facilities, and resources to make measurable progress on their highest priority, clear-cut goals, are not prepared to make judgments based on vague intuitions. It is understandably difficult for organizations to distinguish between the crazy ideas that will lead to breakthroughs, and the genuinely crazy ideas."[12]

What we need is a visionary (or several) who recognizes the clues presented here as a call to provide support for an alternate Plan of Action. Since Plan A has run out of gas (and imagination), we must look to the people with new/old ideas.

We need to support people that will go back and look at the work of the classical (19th century) physicists and pick up the trail from there.

So if you are willing and able to help, or know of someone that can help, please contact one (or more) of the people on the following list. Thank you very much (and our future generations will thank you also).

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References

1. http://www.lerc.nasa.gov/WWW/bpp/
2. http://www.lerc.nasa.gov/WWW/bpp/bpp_CIRCUMVENTING.htm.
3. Llewellen King, publisher of *The Energy Daily, Defense Week, and Environmental Week*, Washington, D.C., at the Intersociety Energy Conversion Engineering Conference, Aug 1991, Boston, MA
4. Talking about our "War for Energy Independence" set out by President Jimmy Carter in 1977, Dr. J. Stuart Fordyce, Deputy director, NASA Lewis Research Center, Cleveland, OH. Keynote speech delivered at the 27th Annual IECEC Conference, Aug, 1992
5. *Science*, Vol. 279, Jan. 1998, p. 302
6. http://www.lerc.nasa.gov/WWW/bpp/bpp_CIRCUMVENTING.htm.
7. Norman Silliman, The Electro-Magnetic Wave Misnomer, *New Energy News*, Vol. 5, No. 8, Dec 1997
8. Edward Teller, *Conversations on the Dark Secrets of Physics*, 1991, Plenum Press, New York, p 3.
9. Chris Hillman <hillman@math.washington.edu.> [News group: sci.physics.relativity] Dec 04, 1997, 8:56pm, in response to the question from Matthew Farrar, "Has any one yet shown or proven exactly why gravity 'happens '"?
10. Eugene Mallove, "New Physics, Life Saving and Philanthropy," *Infinite Energy*, Vol 3, No. 17, Dec 1997, page 3.
11. http: //www.lerc.nas.gov/WWW/bpp/bpp_WHY.htm
12. http://www.lerc.nasa.gov/WWW/bpp/bpp_WHY.htm

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The Source of Excess Energy

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Abstract

The author offers for discussion an explanation for the excess energy in cold fusion, an explanation which incorporates the concept of negative time. The mathematical basis relies on the work of Dr. N. Kozyrev (Russia), Dr. Nassikas (Greece), and Thomas Bearden (USA).

Introduction

"The Hypothesis and The Equations of The Unified Matter Field" by Dr. A. A. Nassikas [1], is a rare instance of scientific and mathematical publication devoted to fundamental questions that leads to a *practical* approach to space-time engineering. In some sense it is a new solution for the development of free energy and gravitation technologies. Dr. H. E. Puthoff provided an overview of the topic based on the Casimir-effect [2]. This was quite interesting, but the author's conclusion was "only in principle, yes," but the engineering (practical applications) is "a long way off." Also that the "warp drive" idea in the papers (1994-1997) of Dr. Miguel Alcubierre, Max-Planck-Institute for Gravitationsphysik, Albert-Einstein-Institute, Germany, is a fine idea, but it does not provide any technological solution. The only author who proposed *practical approaches* to vacuum engineering is Thomas E. Bearden. Let's see what analogies there may be between Nassikas' work and the "Gravitobiology" by T. E. Bearden to indicate the shortest practical way toward the technologies of the future.

The Engine of Space-Time

The vacuum or "space-time medium" of T. E. Bearden is described as cells of so called "gravitons." Those are "the coupled photon/anti-photon pair." Note, that it is a paired process. To make it more clean physically, we have to introduce the negative time axis for the "anti-photon." So, the notion for the "virtual particles" that is used in many papers as the unlimited sea of free energy can be physically introduced only with the notion of "negative time," and we must take into account the "surface of time" or the "area of possible time directions." In this chronal area, the pair of photon/anti-photon seems to be a balanced situation of two processes that don't require any energy input, but it is a situation that produces both photon and anti-photon forms of energy. In other words, it is the "energy creation mechanics" itself. The law of energy conservation seems to be the law for a "direct time" and "reversed time" balanced situation only. Certainly in our reality it is possible to detect by means of some measurements only *half* of the process, i.e. the positive time process of the photon energy.

According to the hypothesis of Dr. A. A. Nassikas, there is no space-time without energy since "The existence or the non-existence of energy implies the existence or the non-existence of space-time, and consequently of any geometry." On this point his concept is closely connected with Bearden's "vacuum engine." Next point: by Nassikas, the energy of positive or negative electrical charge of the particle, i.e. its potential field energy can be presented as "equivalent to its internal time." So, the sign of the charge can be defined by the "time axis direction" and the process of the electron is some opposition to the process of the positron. Bearden's photon/anti-photon pair is a similarly balanced situation. Note, the mass particle here is considered as some dynamical process [3], that is corresponding to some four-dimensional resonance condition, demonstrated in calculations for the DNA-molecule and for other natural material elements.

A practical solution was proposed by Thomas Bearden to create "the local rate of flow of time" that is "determined by the "local time-stress of vacuum potential" is to apply some non-linear materials for translation of energy between different frequencies and harmonics of electromagnetic waves. Normally, i.e. in the ordinary time-flow situation, the non-linear material produce the harmonics from a fundamental wave. But Bearden says that "in a true time-reversed situation, non-linear materials can exhibit the production of a stronger fundamental from a combination of the fundamental and its harmonics." The principle that is designated by Bearden as "Stokes' principle of time reversibility" (G.G. Stokes (*Camb. Dubl. Math. J.* 4, 1849, p.1) is interesting, but we have to discuss something beyond this that is connected with the potential form of energy, *i.e.* with Bearden's "stress of vacuum."

Dr. A. A. Nassikas and Dr. Miguel Alcubierre independently proposed to use the difference in local rate of the time flow as the source for a propulsion force. According to Nassikas, if "the space under the object attracts the object" more or less than the upper one in strength of the different relative times around the object, gravitational propulsion can be achieved. So, all we need to take the next step from theory to technology is to find a way to change the rate of time. Is it too difficult? No, it is quite simple if we take into account some points:

a) The notion "time" in any case is connected with some certain material system, for example, with some elementary particle or with some planetary system. The different velocity of light in different materials is a demonstration of this connection.

b) The "space" of some curvature (of some rate of time) is a bi-directional or many-directional energy process. Electricity is one of many possible balanced situations that is described as a bi-directional or two-polarity case. For many-polarity energetic situations there is the possibility of three or more time-flow directions.

c) There is no difference in principle between an atom and the space around that atom, according to Faraday [4]. So, the balanced chronal situation of the vacuum engine corresponds to some real properties of matter and we can work with matter to reach the changes in the balance of the vacuum engine in the area of this material object.

The vacuum is the medium of some known physical properties, for example, the dielectrical permittivity. Physically, it is connected with the velocity of spreading of the photon, and since we can work with different materials of known properties, it means we have the possibility of changing the parameters of the vacuum engine itself. One quite old example of a practical application is USA patent number 3,187,206, granted in 1959 to Thomas T. Brown. The gradient of dielectrical permittivity is proposed and experimentally proved as the source of reactionless force. It is necessary to note that the same reactionless force is created at the border between two different dielectrical materials of the electrical capacitor, as it is described in many text-

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books on the properties of dielectrical materials. The problem of taking the next step to fundamental conclusions is understanding the physical connection between the permittivity of a material, the velocity of light in the material, and the local rate of time for this area of space.

The patents by Thomas T. Brown include also asymmetrical interaction between electrodes, *i.e.* the topology of the electrical field. Let's note the analogy between Nassikas' idea above on "energy and geometry of space" and the invention by Brown of reactionless propulsion. The gradient of the electrical potential that is created in the natural way with distance from the electrically charged particle is a demonstration of the natural topology of space, *i.e.* the electrical field is created according to the law of creation of space itself. It is the reason for the analogy between the formulation for electrical and gravitational interaction. We have the possibility of changing the topology of the electrical field, for example by means of the asymmetrical dielectrical member in the capacitor of Brown. So we have the possibility of compensating the natural gradient created by the properties of space. It is the way to space-time engineering.

So, the conception by Dr. Nassikas and idea of Dr. Alcubierre are a fine theoretical basis for the technology that was discovered and proved in practice by Thomas T. Brown. Modern industry, specialized in dielectrical materials, is ready now for cheap mass production of warp drive systems. The same technology may be the basis for self-rotating generators. The way is short and all we need is the commercial demand and engineering formulation of a step-by-step program.

The concept of negative time by Dr. Nassikas can be useful also in understanding the over-unity effect that is demonstrated in some cold fusion cells. The well-known Pons-Fleischmann experimental set-up includes a cathode that is over-saturated by protons when the set-up is operating. So, the local concentration of positively charged protons can be considered as a local imbalance in vacuum engine, and the local rate of time in this area is different from the normal one. The processes are produced by this local change of the curvature of space are multilevel complex energy exchange, but the source of over-unity is the local concentration of positive electrically charged protons that is due to the input power source. Let's consider this point more carefully.

Any electrically charged particle can be presented as some volume of space *i.e.* the gravitational space by Nassikas, G-space of energy E_g, that is joined with some imaginary electromagnetic space of energy E_{em}. Conservation of energy is presented as:

$$dE_{em} + dE_g = 0 \qquad \text{F.1}$$

In my view, it is useful to change equation F.1 to the form:

$$dE_g = -dE_{em} \qquad \text{F.2}$$

In this case it is obviously that mathematically the space of E_{em} has an "imaginary" value, since the energy and the velocity are connected by the quadratic root of the negative number.

The over-unity output in cold fusion systems means the production of the excess heat energy. Certainly, some cold fusion systems demonstrate power output as the result of nuclear transmutation processes. But if we are considering the water to be distilled H_2O in which fusion does not occur, I have to suppose only one way for excess heat production:

$$dE_{em} > 0 \text{ if } dE_g < 0 \qquad \text{F.3.}$$

I must note that the idea is not a new one since the famous Russian astrophysicist N.A. Kozyrev created in 1947-1980 the "concept for active properties of the time." There is some natural physical mechanism for production of heat energy that is demonstrated by any star and it is not the thermonuclear reaction but the transformation of energy by the mechanism of Kozyrev. In that concept, the kind of energy that is used by the star for heat energy production is the "time flow." On the other hand, we can take into consideration the gravitational description of space instead of its chronal description, and the production of the heat is the transformation of Eg that we noted above.

N.Kozyrev analyzed the wide experimental astrophysical data to find the answer for the question of the common "special condition of matter" inside any star to provide the transformation of energy Eg into energy Eem. His conclusion [5] is quite simple:

$$B/n_e = 6 \text{ eV} \qquad \text{F.4}$$

where "B" is the density of the beam energy of the star and "n_e" is the density of electrons in the volume of space.

We certainly cannot create the conditions of stellar matter in the laboratory, but for a Pd-cathode in a cold fusion cell, the situation is quite similar to Kozyrev's equation F.4 and heat production can be detected as result of F.3. The difference is the application of protons instead of electrons. To calculate this we have to use the volume density of protons H^+ in the material of the cathode.

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References

1. "The Hypothesis and The Equations of The Unified Matter Field," by Dr. A.A.Nassikas, *Infinite Energy*, March-June 1997, p. 120-124.
2. "Can the vacuum be engineered for spaceflight applications? Overview of theory and experiments," Dr. H.E. Puthoff, *Infinite Energy*, July-November, 1997.
3. "The Concept of Mass Process," Alexander V. Frolov, *Proceedings of International Scientific Conference "New Ideas in Natural Sciences,"* June 1996, St. Petersburg, Russia, published by "Pik" Ltd., 1996.
4. Letter from M. Faraday to R.Teilor of June 25, 1844, published in *Journal of Russian Physical Thought*, N2, 1991, p. 81.
5. N.A. Kozyrev, Selected works, published by Leningrad State University, 1991, p.202, in Russian.

Alexander V. Frolov *(Courtesy the author)*

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Cold Fusion Comix

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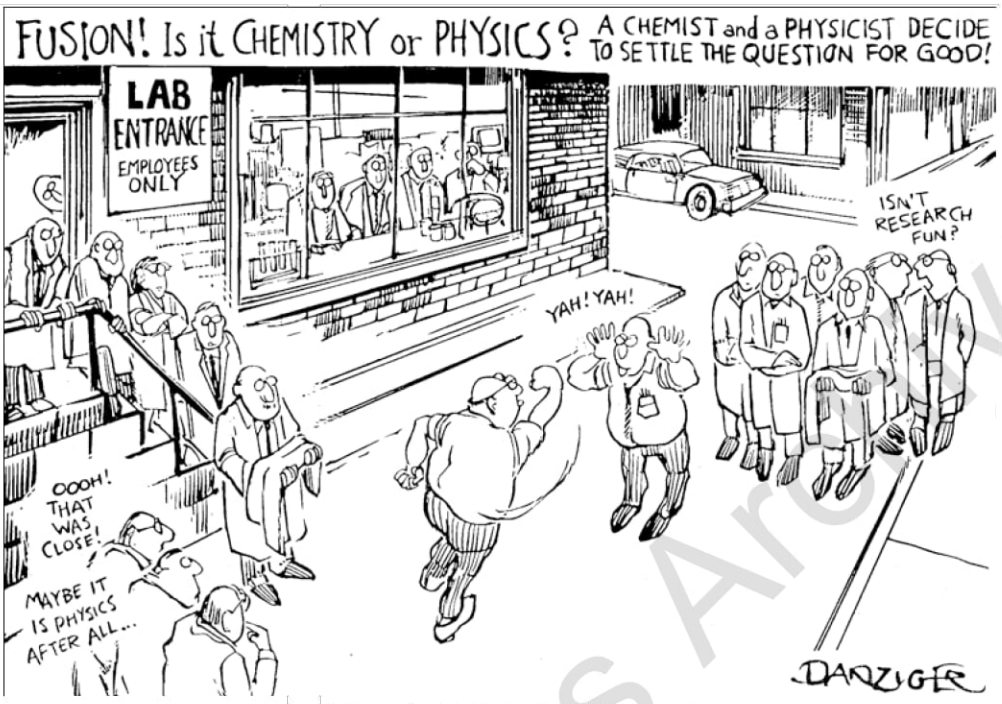

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PUBLIC BAR PEER REVIEW: SIGMUND FREUD ON VACUUM ENERGY • BY SUSAN SEDDON

"Another schnapps please, Bar-Keep, hold the olive.....Now, what was I saying? Oh yes, vacuum energy. Certainly its origin from the principle of uncertainty is a concept familiar to me. Much like my theories on defense mechanisms. I suspect the degree of uncertainty encountered is simply the physical manifestation of self-protection in the face of a real or imagined threat. I propose that the vacuum entity is subconsciously afraid of its absence of presence and, therefore, adopts a strongly anti-presence attitude. This undoubtedly has its origins in a deeply disturbing or traumatic childhood experience. A period of free-associative dream analysis would considerably assist towards alleviating this problem. That the vacuum churns with unseen activity is no major revelation to me. I relate all such phenomena directly to the instinctive drive of the libido. The vacillations observed in vacua are clearly indicative of reaction to preconscious id/ego conflict. It is vital that a means be found of tapping this energy as I fear if it is allowed to continue unrelieved, extremes of aggression may result. Of course, I fully embrace the quantum mechanical concept that a small enough cavity can suppress the natural excitability of a confined particle. I've been saying something along these lines for years. Now take my retention concept..." [In part 2 - Socrates, somewhat the worse for Turkish lager, examines cold fusion.]

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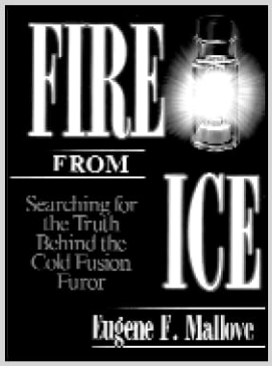

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FRANCIS BACON - A LOOK BACK: by Susan Seddon and Jed Rothwell

Comment by Jed Rothwell
Quotes from Francis Bacon's:
"NOVUM ORGANUM: Aphorisms on the Interpretation of Nature and the Empire of Man"

Bacon invented the scientific method. He was the first to proclaim the importance of experiments and the supremacy of observations over established textbook laws of physics. His understanding of science was imperfect of course. How could it be otherwise, since most of what he predicted did not come about for two hundred years? He considered science primarily inductive; he did not realize the importance of hypotheses and mathematics. What he understood was that knowledge is power and cooperative research lasting decades will lead to enormous progress and give mankind understanding of and control over nature. He understood that the major sources of error in research (what he called "idols") are mainly caused by psychological and cultural limitations, such as our propensity to oversimplify arguments, see only what we are trained to see, and the limitations imposed by language, which may be ill chosen or inadequate to describe a new phenomenon. Terms like "cold fusion" and "host lattice" may confuse the issue because the objects they refer to, it turns out, are poorly described by the words we first selected to label them.

Bacon's most famous aphorism is #3, often abbreviated "knowledge is power." "Knowledge and human power are synonymous, since the ignorance of the cause frustrates the effect. For nature is only subdued by submission, and that which in contemplative philosophy corresponds with the cause, in practical science becomes the rule. And in the introduction: The empire of man over things is founded on the arts and sciences alone, for nature is only to be commanded by obeying her."

Much of what Bacon laid out in *Novum Organum* is forgotten, misunderstood or overlooked by today's working scientists. We still have a great deal to learn from him, as the following quotes show.

67. "The understanding must also be cautioned against the intemperance of systems, so far as regards its giving or withholding its assent; for such intemperance appears to fix and perpetuate idols, so as to leave no means of removing them.

"These excesses are of two kinds. The first is seen in those who decide hastily, and render the sciences positive and dictatorial. The other in those who have introduced skepticism, and vague, unbounded inquiry. The former subdues, the latter enervates the understanding.

"The school of Plato introduced skepticism, first, as it were, in joke and irony, from their dislike to Protagoras, Hippias, and others, who were ashamed of appearing not to doubt upon any subject. But the new academy dogmatized in their skepticism, and held it as their tenet. Although this method be more honest than arbitrary decision, (for its followers allege that they by no means confound all inquiry... but hold doctrines which they can follow as probable, though they cannot maintain them to be true,) yet, when the human mind has once despaired of discovering truth, every thing begins to languish. Hence men turn aside into pleasant controversies and discussions, and into a sort of wandering over subjects, rather than sustain any rigorous investigation. But, as we observed at first, we are not to deny the authority of the human senses and understanding, although weak; but rather to furnish them with assistance.

109. "We may also derive some reason for hope from the circumstances of several actual inventions being of such a nature, that scarcely any one could have formed a conjecture about them previous to their discovery, but would rather have ridiculed them as impossible. For men are wont to guess about new subjects from those they are already acquainted with, and the hasty and vitiated fancies they have thence formed: than which there cannot be a more fallacious mode of reasoning, because much of that which is derived from the sources of things does not flow in their usual channel.

"If, for instance, before the discovery of cannon, one had described its effects in the following manner: There is a new invention by which walls and the greatest bulwarks can be shaken and overthrown from a considerable distance; men would have begun to contrive various means of multiplying the force of projectiles and machines by means of weights and wheels, and other modes of battering and projecting. But it is improbable that any imagination or fancy would have hit upon a fiery blast, expanding and developing itself so suddenly and violently, because none would have seen an instance at all resembling it, except perhaps in earthquakes or thunder, which they would have immediately rejected as the great operations of nature, not to be imitated by man. So, if before the discovery of silk thread, any one had observed, that a species of thread had been discovered, fit for dresses and furniture, far surpassing the thread of worsted or flax in fineness, and at the same time in tenacity, beauty, and softness; men would have begun to imagine something about Chinese plants, or the fine hair of some animals, or the feathers or down of birds, but certainly would never have had an idea of its being spun by a small worm, in so copious a manner, and renewed annually. But if anyone had ventured to suggest the silk worm, he would have been laughed at as if dreaming of some new manufacture from spiders.

"So again, if before the discovery of the compass, any one had said, That an instrument had been invented, by which the quarters and points of the heavens could be exactly taken and distinguished, men would have entered into disquisitions on the refinement of astronomical instruments, and the like, from the excitement of their imaginations; but the thought of anything being discovered, which, not being a celestial body, but a mere mineral or metallic substance, should yet in its motion agree with that of such bodies, would have appeared absolutely incredible. Yet were these facts, and the like (unknown for so many ages) not discovered at last either by philosophy or reasoning, but by chance and opportunity; and (as we have observed)' they are of a nature most heterogeneous, and remote from what was hitherto known, so that no previous knowledge could lead to them.

"We may, therefore, well hope that many excellent and useful matters are yet treasured up in the bosom of nature, bearing no relation or analogy to our actual discoveries, but out of the common track of our imagination, and still undiscovered, and which will doubtless be brought to light in the course and lapse of years, as the others have been before them; but in the way we now point out, they may rapidly and at once be both represented and anticipated.

110. "There are, moreover, some inventions which render it probable that men may pass and hurry over the most noble discoveries which lie immediately before him. For however the discovery of gunpowder, silk, the compass, sugar, paper, or the like, may appear to depend on peculiar properties of things and nature, printing at least involves no contrivance which is not clear and almost obvious. But from want of observing that although the arrangement of the types of letters required more trouble than writing with the hand, yet these types once arranged serve for innumerable impressions, whilst manuscript only affords one copy; and again, from want of observing that ink might be thickened so as to stain without running (which was necessary, seeing the letters face upwards, and the impression is made from above), this most beautiful invention (which assists so materially the propagation of learning)

remained unknown for so many ages.

"The human mind is often so awkward and ill-regulated in the career of invention that it is at first diffident, and then despises itself. For it appears at first incredible that any such discovery should be made, and when it has been made, it appears incredible that it should so long have escaped men's research. All which affords good reason for the hope that a vast mass of inventions yet remains, which may be deduced not only from the investigation of new modes of operation, but also from transferring, comparing, and applying these already known, by the method of what we have termed literate experience."

English translations are available in many libraries, and most of the text is on the Web at: http://history.hanover.edu/texts/bacon/title.htm

Loren Eiseley, *The Man Who Saw Through Time* (Scribner, 1973), ISBN 0-684-13285-0, $8.95 Out of print.
Review by Susan Seddon

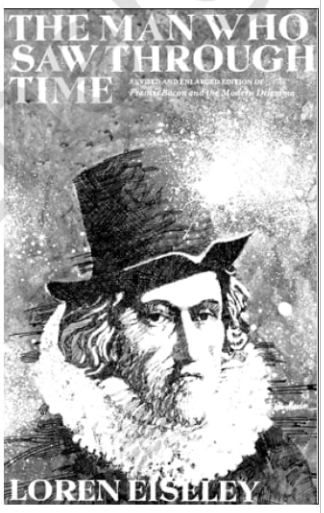
This revised and expanded edition of Eiseley's 1962 essay "Francis Bacon and the Modern Dilemma" is far from a bland, historical account of Bacon's trials at the court of Queen Elizabeth I. It is instead a glowing tribute to his insight and perspicacity, and to his curious ability to peer beyond the narrow, mist-shrouded horizons of severely restricted 16th century thinking to the exciting, shining vistas of the brave new world he knew, with certainty, lay beyond.

Eiseley's wonderfully descriptive tribute, wrought with vivid richness and artistry, breathes new and vibrant life into the philosophies espoused by this long-dead lawyer, courtier and essayist.

From his lofty vantage point in a future Bacon could only dream of, Eiseley draws aside time's draperies, casting a powerful beacon of light down the centuries to illuminate a long disused and overgrown pathway along which he searches for the mind of the man he clearly regards as a kindred spirit.

Eiseley and Bacon - four centuries apart - share an almost identical appreciation of the unique, ephemeral and potentially destructive nature of science.

Eiseley states: "Scientific thought demands some kind of unique soil in which to flourish. It has about it the rarity of a fungus springing up in a forest glade, only to perish before nightfall. Perhaps, indeed, its own dynamism contains its doom."



Bacon would have understood. Along the illuminated pathway, fleetingly linking the centuries, echo his words of caution, uttered long before mankind had become acquainted with the more fearful aspects of his self-created technologies: "Look. There is tomorrow. Take it with charity, lest it destroy you."

Shrugging aside the accusations retrospectively leveled against Bacon of being the father of materialism and technocracy, Eiseley looks beyond the veneer of shallow misinterpretation and focuses his attention instead on seeking to understand the machinations of the soul of this great statesman of science.

His conclusion is that Bacon's ideas embodied "the essence of science as we know it today"—an ideal coupling of objectivity and open-mindedness.

Of the scientific method, Bacon said: "This is the foundation of all, for we are not to imagine or suppose, but to discover what nature does or may be made to do."

As Eiseley much more eloquently points out, Bacon's thinking was as profound, relevant and important in its own way as any practical device born of the most ingenious inventor. He was "an inventor in thought."

Bacon's legacy to 20th century educational practices does not go unacclaimed. The substitution of inductive for metaphysical reasoning was one of the neon signs pointing the way to modern science and the quest for absolute truths. Bacon's abhorrence of "classical" education naturally made him highly unpopular in his day.

This revised essay was penned in 1973, against the background of a very curious, and uncertain, period in world affairs. There were new, and rapidly emerging, potential "superpowers;" arms limitation treaties had only a cursory effect. Stage management of the cold-war backdrop scenery was ever shifting—in a state of seemingly permanent flux.

Eiseley had cause to fret and heed yet another of Bacon's futuristic warnings: "Mere power and mere knowledge exalt human nature but do not bless it."

This was the tomorrow which Bacon begged we took with charity, lest it destroy us. His dreaded vision came dangerously close to reality.

Bacon even anticipated scientific narrow-mindedness and the reluctance to break open the solid stone moulds of tradition and acceptability.

"Things in themselves new will yet be apprehended with reference to what is old," he wrote.

Eiseley mourns Bacon's passing and the ineffectual impact on his contemporaries that he strove all his life to improve upon: "He died, broken and forlorn in an age he never truly inhabited;" and that his legacy to the modern world remains largely unappreciated in the pure manner in which Bacon would have wished to be remembered.

"Nature is often hidden, sometimes overcome, seldon extinguished." *Of Nature in Man - 1625*

"If a man will begin with certainties, he shall end in doubts; but if he will be content to begin with doubts, he shall end in certainties. "
The Advancement of Learning 1602

FRANCIS BACON
(1st Baron Verulam and Viscount St Albans) 1561 - 1626

Francis Bacon was born on January 22 in London, England. His father, Sir Nicholas, was then Lord Chancellor to Queen Elizabeth I.

Bacon studied law at Trinity College, Cambridge and became a barrister in 1582. He always harbored political ambitions, but was destined never to find true favor at the Royal Court.

In 1584, as a Member of Elizabeth's Counsel, he angered her by his vocal opposition to her plans for raising taxes to finance the war with Spain and, as a result, never achieved high office during her reign, in spite of his obvious political skills and many recommendations from her senior advisers.

Following Elizabeth's death in 1603, he renewed his efforts with the new monarch, James I. He gained a knighthood that same year, though mostly due to family influence and persuasion.

He dedicated his work "Advancement of Learning" to James who failed to be overly impressed. Bacon remained virtually unacknowledged until 1617 when he gained his father's old post of Lord Keeper. James had finally realized his usefulness to

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him and the value of his political and legal knowledge. Even so he remained very much on the periphery of the Royal Court.

He wrote his celebrated work "Novum Organum" in 1620 in Latin.

The following year, he was imprisoned in the Tower of London following accusations of corruption. He was only briefly confined but he was ordered to pay £40,000 in recompense.

It was a further two years before the King forgave him and he was once more allowed into royal circles, but he was never officially pardoned.

Bacon's attempted advancement of scientific thinking was, like most of his other ambitions, never realized during his lifetime. However, he remained curious to the last. He died, on April 9, 1626, as the result of a chill he caught whilst collecting snow in order to examine the effects of cold on putrefaction.

Eiseley, Loren (Corey) Author of *The Man Who Saw Through Time* (Taken from *Encyclopedia Britannica*):

(b. Sept. 3, 1907, Lincoln, Neb., U.S. —d. July 9, 1977, Philadelphia), U.S. anthropologist, educator, and author who wrote about anthropology for the lay person in eloquent, poetic style.

Eiseley was educated at the University of Nebraska (B.A., 1933) and the University of Pennsylvania (M.A., 1935; Ph.D., 1937) and began his academic career at the University of Kansas (1937-44) and Oberlin College (1944-47). In his long association with the University of Pennsylvania he served as professor of anthropology (1947-61), curator of early man at the University Museum (1947-77), provost of the university (1959-61), and professor of anthropology and the history of science (1961-77). He also served as a consultant to museums, foundations, and the U.S. government and was the host-narrator of the television series "Animal Secrets" (1966-67). He received numerous honours, including membership in the National Institute of Arts and Letters and the American Academy of Arts and Sciences.

Eiseley's scientific research centred on the dating of index fossils of the Pleistocene Epoch and the extinction of Ice Age fauna. His writings, however, covered the wide range of the question of evolution and its implications for humanity. He published more than a dozen books, including *The Immense Journey* (1957), *Darwin's Century* (1958), *The Firmament of Time* (1960; reprinted 1970), *The Unexpected Universe* (1969), and *The Night Country* (1971). He also published an autobiography, *All the Strange Hours* (1975), and a collection of poetry, Another Kind of Autumn (1977). A collection of his poems and selected essays, *The Star Thrower*, was published in 1979.

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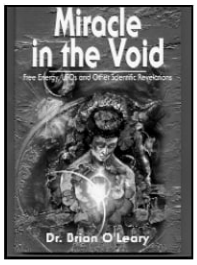

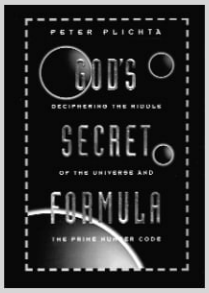

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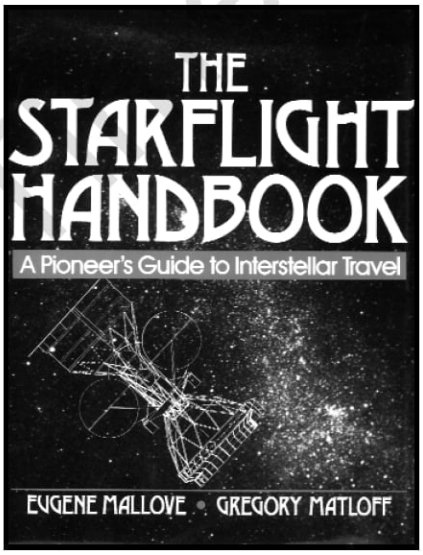

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